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THERAPY OF NEUROSYPHILIS JUDGED BY ARSENIC PENETRATION OF MENINGES

METHODS OF TREATING NEUROSYPHILIS *

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AND

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Of the methods of neurosyphilitic treatment, the more commonly used are the following:

(*a*) Intensive antisyphilitic medication; this consists of arsphenamin given intravenously, mercury and the iodids with such hygienic and supportive treatment as may be indicated for the individual case. In favor of this treatment is its simplicity and its relative freedom from complications. Arsphenamin given intravenously results invariably in arsenic penetration into the spinal fluid according to Benedict,[1] and in only 30 per cent. of the cases according to Reiger and Solomon.[2] The clinical results obtained vary widely; some cases are very successful, others less satisfactory, and some types are absolutely resistant to this form of medication.

(*b*) Drainage of the spinal fluid following previous intravenous injection of arsphenamin has been advocated. It is argued that drainage of spinal fluid increases the amount of arsenic in the spinal fluid following the intravenous injection. This method is simple and has but little unfavorable reaction. The clinical results occasionally are good, but perhaps not better than those treated by the simple intensive method.

(*c*) The intradural methods of Swift and Ellis, Ogilvie and Byrnes attempt to still further increase the concentration of a spirochetacidal substance in the spinal fluid by introducing into the subarachnoid space blood serum reenforced with arsenic or mercury. Against these methods have been urged the technical difficulties in giving the treat-

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* From the Neurological Clinic of Stanford University Medical School.

1. Benedict, cited by Sachs: Am. J. M. Sc. **148**:693, 1914.

2. Reiger, J. B., and Solomon, H. C.: The Circulation of Arsenic in the Cerebrospinal Fluiid, J. A. M. A. **71**:15 (July 6) 1918.

ment, painful reaction to the patient and complications that have followed especially when the serum was too highly fortified in the Ogilvie and Byrnes modification. The clinical results in the hands of many investigators have been especially satisfactory in cases resistant to other forms of treatment.

Up to the present time there has been considerable difficulty in estimating the relative values of the above methods. Each method has its advocates who report series of cases in which the majority have improved under the particular treatment employed.

VALUE OF METHODS TESTED BY PENETRATION

It has even been denied that the presence of an antispirochetal substance in the spinal fluid was of advantage to the patient. While this point is not entirely clear, there is evidence tending to show that certain types of meningitic lesions are amenable to local treatment. This is particularly true of Flexner's intraspinous treatment of epidemic cerebrospinal meningitis. The lesions of neurosyphilis are so diffuse in location, kind and intensity that therapy directed to the meninges alone would benefit only a limited number of patients. Clinical results have shown that the parenchymatous lesions of paresis are least benefited by the introduction of spirochetacidal substance into the spinal fluid. Meningeal lesions are the most benefited. Inasmuch as we are unable to state the exact moment at which a given case of neurosyphilis passes from a meningeal to a parenchymatous state, therapy directed to the meninges would seem to have a considerable field of usefulness.

The concentration of spirochetacidal substance in the spinal fluid necessary to get clinical results is another mooted point. Whether reenforcing the serum with arsenic or mercury as done in the Ogilvie and Byrnes method gives us an increased therapeutic effect sufficient to offset the increased meningeal irritation, is again not clear. Swift[3] himself believes that the high concentration is unnecessary. He bases the success of the intradural methods more on the spirochetacidal action of a serum with a low arsenic concentration—the presence of syphilitic antibodies in the serum and local action of an irritating effect produced by serum and chronic inflammatory process. On the basis of experiments on dogs and man, he differs with Sicard[4] in believing that the irritation of the meninges was unable to cause a let down of the barrier between the blood and spinal fluid.

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3. Swift, Homer F.: Intraspinal Therapy in Syphilis of the Central Nervous System, J. A. M. A. **65**:209 (July 17) 1915. Stillman and Swift: Cited by Swift in same article.

4. Sicard, J. A.: Bull. et mém Soc. méd d. hôp. de Par. **36**:681, 1913.

OUTLINE OF PRESENT INVESTIGATION

The following experiments were undertaken to find out if the normal penetration of arsenic into the spinal fluid could be increased by an irritation of the meninges such as must occur in all of the intradural treatments. It seemed important to reinvestigate this point as the studies of Flexner and Amos[5] on poliomyelitis had demonstrated a definite let down in the barrier between the blood and spinal fluid that could be caused by a variety of irritants.

CHEMICAL ANALYSIS

Quantitative estimations of the arsenic penetration in the meninges have been made on approximately 100 spinal fluids after the various methods of treatment. The analytic method used in detail is as follows: The sample of cerebrospinal fluid is placed in a 200 c.c. round bottom flask. Five c.c. of arsenic-free strong nitric acid and 3 c.c. of pure sulphuric acid are added. The contents are boiled slowly until the brown fumes cease, then concentrated until the first appearance of the white sulphur trioxid. The sulphuric acid should be nearly colorless; if not, a few more cubic centimeters of nitric acid are added and the digestion repeated. To the cooled acid 5 c.c. of water are added and boiled again until the first appearance of white fumes. Heating should be avoided after sulphur trioxid appears. About 15 c.c. of water are added and allowed to cool to room temperature. The fluid is then transferred to a 30 c.c. bottle and the volume made up to 25 c.c.

Through the cork of the bottle is a glass tube, the dimensions of the lower part of which are 1 cm. by 10 cm., and the upper part drawn out to 0.4 cm. by 6 cm. In the lower part of this tube near the constriction, glass wool moistened with a solution of lead acetate is placed with dry lead acetate paper below. In the constricted part of the tube is inserted a 0.3 cm. by 6 cm. strip of mercuric chlorid paper (filter paper soaked in 5 per cent. mercuric chlorid, dried and placed in stoppered tube). Ten gm. of arsenic free granulated zinc are just covered with 5 per cent. pure copper sulphate. This is washed free from the copper sulphate and added to the 25 c.c. of solution in the bottle; the cork and upright glass tube are immediately inserted. A rapid stream of hydrogen is evolved for some time. In about twenty minutes 1 c.c. of 5 per cent. copper sulphate is added to the bottle; this will again increase the rate of evolution of gas. In forty minutes from the addition of the zinc compare the intensity and extent of the color on the mercuric chlorid strip with standard strips of same sample

5. Flexner, S.: Neutralizing Substances in Poliomyelitis, J. Exper. Med. **25**:499 (April) 1917; Amos, H. L.: Ibid.

TABLE 1.—GROUP A—CONTROLS

Serial No.	No. of History	Diagnosis	Cells before Treatment	Cell Reaction	Amount of Fluid Withdrawn, C.c.	Amount of Fluid Examined for Arsenic, C.c.	Total Arsenic in Mg.	Arsenic in Micromilligrams per C.c.
1	66105	Cerebrospinal syphilis	2	5	25	15	0	0
2	63911	Syphilis	0	0	20	10	0	0
3	65976	Tabes	6	6	20	10	0.0005	0.05
4	60673	Cerebrospinal syphilis	60	4	22	12	0	0
5	13131-13	Tabes	6	0	25	15	0	0
6	52727	Tabes	6	1	22	12	0	0
7	50861	Cerebrospinal syphilis	3	1	25	15	0.0004	0.03
8	29145	Cerebrospinal syphilis	51	8	25	15	0	0
9	65976	Tabes	6	6	25	15	0	0
10	64706	Cerebrospinal syphilis	30	48	25	15	0.0010	0.07
11	44000	Syphilis	2	10	30	20	0.0008	0.04
12	60698	Syphilis	0	1	30	20	0	0
13	50931	Cerebrospinal syphilis	40	4	25	15	0.0015	0.10
14	54706	Cerebrospinal syphilis	30	23	30	20	0	0
15	50931	Cerebrospinal syphilis	40	4	30	20	0.0040	0.20
16	51750	Tabes	1	2	30	20	0.0005	0.04
17	55404	Syphilis	0	0	20	10	0.0003	0.03
18	60698	Syphilis	0	38	30	20	0	0
19	60698	Syphilis	0	9	25	15	0	0
20	60698	Syphilis	0	8	25	15	0.0005	0.03
21	63727	Tabes (burnt out)	2	2	20	10	0	0
22	63727	Tabes (burnt out)	2	0	20	10	0	0
23	60442	Cerebrospinal syphilis	10	10	25	15	0	0
24	60442	Cerebrospinal syphilis	10	34	20	10	0	0
25	60442	Cerebrospinal syphilis	10	2	25	15	0	0
26	54706	Cerebrospinal syphilis	30	5	25	15	0	0
27	60797	Tabes	28	5	25	15	0	0
28	49866	Syphilis	1	1	25	15	0.0010	0.07
29	50861	Cerebrospinal syphilis	3	1	25	15	0	0
30	63930	Syphilis	1	1	40	30	0	0
31	30688	Cerebrospinal syphilis	9	9	20	10	0.0004	0.04
32	65473	Tabes	5	3	20	10	0.0010	0.10
33	49866	Syphilis	1	1	22	12	0.0006	0.05
34	50861	Cerebrospinal syphilis	3	1	25	15	0.0010	0.07
35	49866	Syphilis	1	1	20	10	0.0040	0.40
36	43525	Cerebrospinal syphilis	47	10	30	20	0	0
37	44000	Syphilis	2	10	20	10	0.0010	0.10
38	66361	Cerebrospinal syphilis	10	10	20	10	0	0
39	66766	Cerebrospinal syphilis	445	1560	25	15	0	0
40	44469	Tabes	5	5	20	10	0	0
41	66105	Cerebrospinal syphilis	2	10	20	10	0.0007	0.07
42	44469	Tabes	5	2	30	20	0.0010	0.05
43	66105	Cerebrospinal syphilis	2	5	20	10	0	0
44	51750	Tabes	1	0	25	15	0.0006	0.04

of paper colored by known amounts of arsenic produced in the same apparatus under the same condition as the unknown. In this way 0.1 mmg. (1 micromilligram = 0.001 milligram) of arsenic can be detected. Up to 1 mmg. the results are probably correct to 0.2 mmg. Between 1 and 10 mmg., the error is probably not greater than 0.5 mmg.

TABLE 2.—GROUP B

Serial No.	No. of History	Diagnosis	Cells before Treatment	Cell Reaction	Amount of Fluid Withdrawn, C.c.		Amount of Fluid Examined for Arsenic, C.c.		Total Arsenic in Mg.		Arsenic in Micromilligrams per C.c.	
					First Drainage	Second Drainage	First Drainage	Second Drainage	First Drainage	Second Drainage	First Drainage	Second Drainage
1	54293	Tabes	11	—	50	30	40	20	0	0	0	0
2	50861	Cerebrospinal syphilis	2	—	45	35	35	25	0	0	0	0
3	44878	Tabes	20	—	45	30	35	20	0	0	0	0
4	28386	Cerebrospinal syphilis	30	+	55	35	45	25	0.0004	0.0007	0.01	0.03
5	68229	Tabes	23	—	25	20	15	10	0	0	0	0
6	18841	Cerebrospinal syphilis	17	—	45	30	35	20	0	0	0	0
7	64706	Cerebrospinal syphilis	30	—	55	45	45	35	0.0003	0	0.01	0
8	60698	Syphilis	0	—	30	30	20	20	0	0	0	0
9	58556	Cerebrospinal syphilis	48	—	30	25	20	15	0	0	0	0
10	29145	Paresis	4	—	35	30	25	20	0	0	0	0
11	29145	Cerebrospinal syphilis	51	—	35	35	25	25	0.0004	0.0003	0.02	0.02
12	62047	Tabes	4	—	40	25	30	15	0	0.0003	0	0.03
13	51750	Tabes	1	—	25	30	15	20	0.0006	0	0.04	0
14	50861	Cerebrospinal syphilis	2	—	40	35	30	25	0	0	0	0
15	49866	Syphilis	1	—	25	30	15	20	0	0	0	0
16	52727	Tabes	1	—	50	35	40	25	0.0003	0	0.007	0
17	54293	Tabes	14	—	50	30	40	20	0	0	0	0
18	70143	Cerebrospinal syphilis	14	—	?	30	?	20	0	0.0003	0	0.012
19	70143	Cerebrospinal syphilis	14	—	?	35	?	25	0	0	0	0
20	69649	Cerebrospinal syphilis	4	—	50	25	40	15	0	0	0	0
21	69649	Cerebrospinal syphilis	4	—	30	30	20	20	0.0016	0	0.08	0

TABLE 3.—GROUP C

Serial No	No. of History	Diagnosis	Cells before Treatment	Cell Reaction	Amount of Fluid Withdrawn, C.c.	Amount of Fluid Examined for Arsenic, C.c.	Total Arsenic in Mg.	Arsenic in Micromilligrams per C.c.
1	46808	Tabes	6	—	30	20	0	0
2	70859	Cerebrospinal syphilis	14	—	25	15	0	0
3	15108	Tabes	451	—	25	15	0	0
4	70849	Paresis	14	—	25	15	0	0
5	58556	Cerebrospinal syphilis	45	—	30	20	0	0

RESULTS OBTAINED

GROUP A consists of forty-four cases in which spinal drainage was performed one hour following simple intravenous injection of 0.6 gm. arsphenamin. We chose the interval of one hour, as Reiger and Solomon found that arsenic concentration in the spinal fluid attained its maximum at this time. Forty-three per cent. of these cases gave

positive tests for arsenic, averaging 0.036 mmg. of arsenic per cubic centimeter of spinal fluid.

Group B consists of twenty-one cases in which intravenous injection of arsphenamin was followed in less than an hour by a complete drainage of the spinal fluid. One hour after the first drainage a second lumbar puncture was done to determine whether complete drainage tended to increase the amount of arsenic penetration. In 29 per cent. of the cases arsenic penetrated in half an hour; in only 19 per

TABLE 4.—Group D

Serial No.	No. of History	Diagnosis	Cells before Treatment	Cell Reaction	Temperature Reaction	Amt. of Fluid Withdrawn, C.c.	Amt. of Fluid Examined for Arsenic in C.c.	Total Arsenic in Mg.	Arsenic in Micromilligrams per C.c.
1	44469	Tabes	5	6	101.0	20	10	0.008	0.30
2	27530	Tabes	4	2,300	100.5	25	15	0.002	0.13
3	27530	Tabes	4	385	102.0	13	3	0.0005	0.17
4	2093	Paresis	26	125	99.8	25	15	0.001	0.07
5	18841	Cerebrospinal syphilis	17	126	99.8	25	15	0.0004	0 03
6	65473	Tabes	5	2.040	100.5	25	15	0.002	0.13
7	46808	Tabes	10	1,660	101.0	25	15	0 002	0 13
8	66105	Cerebrospinal syphilis	2	108	99.0	22	12	0.004	0.33
9	58556	Cerebrospinal syphilis	48	60	98.2	25	15	0.004	0.27
10	58556	Cerebrospinal syphilis	48	24	98 6	30	20	0.001	0.05
11	56530	Tabes	5	191	99.2	17	7	0.003	0 43
12	56530	Tabes	5	456	99.5	20	20	0.008	0.40
13	50931	Cerebrospinal syphilis	40	3,280	101.0	20	10	0.0005	0.05
14	60442	Cerebrospinal syphilis	10	.....	98.0	25	15	0.001	0.07
15	60442	Cerebrospinal syphilis	10	710	100.8	25	15	0.0005	0.03
16	60698	Syphilis	0	103	99.6	30	20	0.0007	0.04
17	60767	Tabes	5	765	99.5	30	20	0.0005	0 03
18	60673	Cerebrospinal syphilis	6	2,980	99.0	35	25	0.001	0.04
19	52727	Tabes	1	61	98.8	35	25	0.0006	0.02
20	62047	Tabes	4	75	100.4	30	20	0.001	0.05
21	62047	Tabes	4	19	99.2	25	15	0	0
22	60442	Cerebrospinal syphilis	10	.....	99.4	25	15	0.0008	0.05
23	14361	Cerebrospinal syphilis	23	1,320	101.0	20	10	0 0005	0.03
24	64818	Cerebrospinal syphilis?	3	1,136	100.0	25	15	0.001	0 07
25	65547	Tabes (burnt out)	5	4,200	101.2	25	15	0.0015	0.10
26	61725	Cerebrospinal syphilis	48	2,000	99.5	25	15	0	0
27	49360	Cerebrospinal syphilis	44	470	101.5	20	10	0.0008	0.08
28	63727	Tabes (burnt out)	2	696	101.0	30	20	0.003	0.15
29	68925	Cerebrospinal syphilis	60	525	100.5	30	20	0.0004	0.02
30	68925	Cerebrospinal syphilis	60	750	100.0	30	20	0.002	0.10
31	46808	Tabes	10	1,600	101.4	35	25	0.0015	0.06
32	41067	Cerebrospinal syphilis	1	39	100.0	16	6	0.002	0.33
33	68925	Cerebrospinal syphilis	126	1,350	100.5	25	15	0	0
34	65714	Cerebrospinal syphilis	19	10	98.8	45	35		
35	30882	Tabes	1	1,380	101.0	35	25	0.0010	0.04
36	29145	Cerebrospinal syphilis	11	99	99.6	35	25	0.0003	0.012
37	70849	Cerebrospinal syphilis	15	298	102.0	25	15	0.0008	0.05
38	70143	Cerebrospinal syphilis	17	127	101.0	30	20	0.0008	0.04
39	69649	Cerebrospinal syphilis	4	320	99.0	20	10	0.0005	0.05
40	70849	Paresis	15	298	102.0	25	15	0.0008	0.05

cent. of the cases was arsenic found on the second drainage. The average amount of arsenic penetrating in the first drainage was 0.008 mmg.; in the second drainage was 0.0044 mmg. Allowing for the fact that this group contains a smaller number of cases than Group A, we can conclude that the number of penetrations is certainly not greater than that obtained by simple intravenous injection.

Group C consists of five cases in which a complete drainage was made an hour before the intravenous injection of arsphenamin and

this showed no arsenic penetration an hour after the injection. Apparently, placing the drainage before instead of after the intravenous injection has no advantages.

GROUP D consists of forty cases in which the patient's own serum was injected into the subdural space followed in from six to eight hours by an intravenous injection of arsphenamin. One hour after the injection a lumbar puncture was made. Ninety-two per cent. of these cases gave a positive test for arsenic in the spinal fluid. Quantitatively, they averaged 0.103 mmg. per cubic centimeter. The meningeal irritation resulting from the serum injection ranged from a reaction 100 to 2,300 cells per cubic millimeter.

APPLICATION TO TREATMENT

It would seem that the foregoing results could be applied to the treatment of neurosyphilitics in the following way: (1) Every case should have the benefit of intensive intravenous medication until we are certain that the case belongs among those with impermeable membranes. (2) Our experiments would suggest that for the cases resistant to ordinary therapy, in order to obtain the maximum concentration of arsenic in the spinal fluid, the patient's own blood serum should be injected into the subarachnoid space six hours before the arsphenamin is given intravenously. This serum may be injected as in the Swift-Ellis technic, or, if necessary, arsenic or mercury may be added according to the Ogilvie or Byrnes technic. This procedure is not more complicated than either of the intradural methods, and has the definite advantage of allowing arsenic to pass from the blood to the spinal fluid in greatly increased concentration. Clinically, we have carried this process through in eighty cases. These cases were chosen because we had treated them previously by the ordinary intensive antisyphilitic treatments with meager results.

SUMMARY

Irritation of the meninges by intradural injection of the patient's own serum caused a cellular reaction ranging from 100 to 2,300 cells per cubic millimeter of spinal fluid.

2. Simple intravenous injection of 0.6 gm. arsphenamin resulted in a positive test for arsenic in the spinal fluid in 43 per cent. of the cases.

3. Complete drainage of the spinal fluid did not increase the number of arsenic penetrations.

4. Intravenous injection of arsphenamin six hours after meningeal irritation gave 92 per cent. penetrations and compared with the controls, gave three times as strong an average concentration of arsenic.[6]

6. In addition to the references given, the following may be of interest: Barbat, J. H.: Permeability of the Meninges to Arsenic in Paresis and Tabes, J. A. M. A. **70**:147 (Jan. 19) 1918.

LOCOMOTOR DISTURBANCES IN DISEASE OF THE CEREBELLUM

A GRAPHIC STUDY

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In a recent communication[1] I reported the results obtained by graphically recording the gait of an animal after two different types of experimental lesions of the cerebellum. The records obtained indicated changes, characteristic of the type of lesion, which could not be detected by ordinary observation. This led me to believe that the graphic study of locomotion, which Marey truthfully designated "the microscope of movement," might be useful in the study of cerebellar disease in men: It might indicate not only the presence, but also the location of a lesion. For this method I had to consider:

First. The type of locomotion should be one in which all the limbs are in action. Even in the ordinary progression of man, there is simultaneous activity of all the extremities, each arm swinging forward with the advance of the contralateral leg.[2] But this activity of the arms is rudimentary, inconstant and irregular, and could hardly be utilized for cerebellar localization. Still, the action of the arms should be studied because it is generally accepted that the crus primum of lower animals[3] (corresponding to the lobus quadrangularis and lobuli semilunares in the cerebellum of man) dominates the homolateral anterior limb. Failure to study movements of the upper limbs would leave us in the dark as to whether such disorder in the lower limbs is due to a lesion in the leg area of the cerebellum, or is merely secondary to a lesion in the arm area.

Second. The phase of locomotion studied should be that of extension. This phase is undeniably an expression of neuromuscular activity, and depends on integrity of the cerebellum. The flexion stage, on the

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1. Meyers, I. Leon: The Cerebellar Gait. A Pedegraphic Study, J. Nerv. & Ment. Dis. **48**:14, 1919.

2. Graham, Brown: Note on the Movements of Progression in Men, J. Physiol. **14**:17, 1912; Pettigrew, J. Bell: Design in Nature, New York, Longmans, Greene & Co. **3**:1120, 1908; Thompson, H. Campbell: Associated Movements, Brain **26**:518, 1903.

3. Meyers, I. Leon: Cerebellar Localization. An Experimental Study by a New Method, J. A. M. A. **67**:1745 (Dec. 9) 1916; Van Rynbeck, G.: Erg. d. Physiologie **12**:536, Asher-Spiro's, Wiesbaden, 1912.

other hand, may be brought about entirely by the mechanical laws governing a compound pendulum.[4]

These two requirements could best be met, in my judgment, by recording the extension phase in a person ascending a stairway with a convenient railing on either side of him. In this type of progression both upper as well as lower limbs are almost always in action, the tendency being to help the legs by pressure of the hands on the railing. Generally, the contralateral arm and leg act together, especially if the subject's attention be distracted from his extremities. In consciously innervating the lower limbs a normal person may not use the arms at all. But this interference with the experiment is much less apt to be present if the person ascending the stairway is suffering from weakness or unsteadiness in the legs, because then he seeks to compensate by use of the arms.

In studying the simultaneous action of an upper and its contralateral lower limb we bear in mind that there is no strict parallelism in the action of the two. The action of the lower limb, to use the simile employed by Borelli, is of the same character as that of the boatman's oars which advance the boat by propelling the resistant water toward the stern. By extension this limb exerts pressure on the ground, which being an unyielding medium, reacts on the body, propelling it in the opposite direction, i. e., forward. The action of the upper limb is like that of the boathook which causes the boat to come to the shore by being fastened to a stationary object and being pulled on. However, the action of either limb is brought about by neuromuscular activity, and either limb employs the extensor muscles (as discussed farther on). I see no objection, therefore, to considering the movements as similar and comparable.

THE APPARATUS FOR CARRYING OUT THE EXPERIMENTS

Lower Limbs.—Two pieces of heavy linoleum fitting the sole of the foot are sewed together. In the lower are cut two fenestra, one for the heel, one for the ball of the foot, and into each is fitted an air bulb (1 and 2) easily made from a piece of rubber tubing. From each air bulb leads a piece of slender rubber tubing (3 and 3) to a glass T tube (4), the soles being grooved for its passage. This double sole with air bulbs is then encased in heavy cloth (6) and the whole securely bound to the foot with tapes. A rubber tube 20 feet long (5) connects the stem of the glass T tube (4) with a Marey's tambour.

4. Weber, Wilhelm and Eduard: Mechanik d. Menschlichen Gehwerkzeuge, Goettingen, 1836; Wilhelm Weber's Werke, Verlag von Julius Springer, Berlin, 1894, Vol. 6; Duchenne, G. B.: Physiologie des Mouvements, 1867, p. 410.

Upper Limbs.—An air chamber (3) is made of two circular steel plates about 1½ inches in diameter (4), and a piece of rubber tubing of sufficient caliber to be hermetically fastened to the periphery of each. Into what is to be the upper plate is soldered a steel communication tube from which leads a rubber tube (5) connecting this air

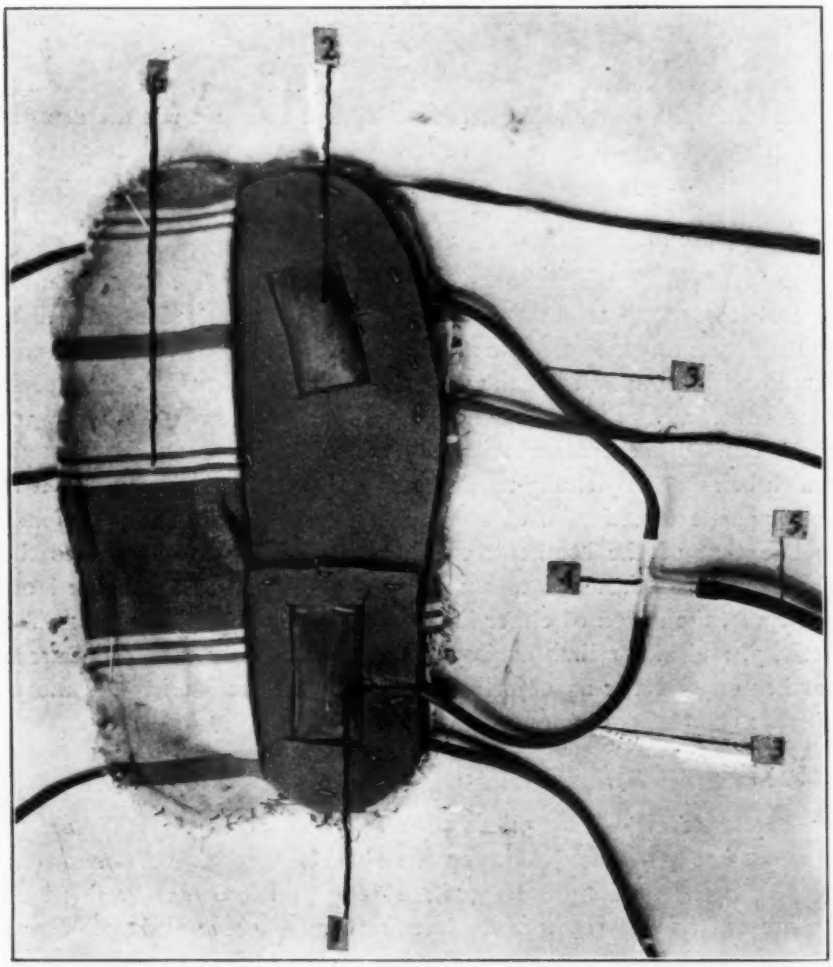

Fig. 1.—Apparatus for recording the movements of the lower limbs.

chamber with a Marey's tambour. This chamber is held firmly on the back of the hand by means of a rigid steel bar (2) fastened to its upper disk. The other end of the bar is soldered to a steel half-wristlet (1) embracing about the dorsal half of the lower forearm, where it is securely fastened in place.

Each of the four appliances on hand and foot having been fastened in place and connected with its respective tambour, and each tambour having been connected with a proper revolving drum of a kymograph, we are ready to make records.

THE NORMAL GAIT

The subject is instructed to ascend the stairway, with attention diverted from the movement of his limbs. In starting he would better have one hand rest on the railing, the other free. The rapidity with which the drum is allowed to revolve should vary in accordance with the pace of the individual. He should ascend at least eight or ten steps. The gait records thus obtained, while subject to some irregu-

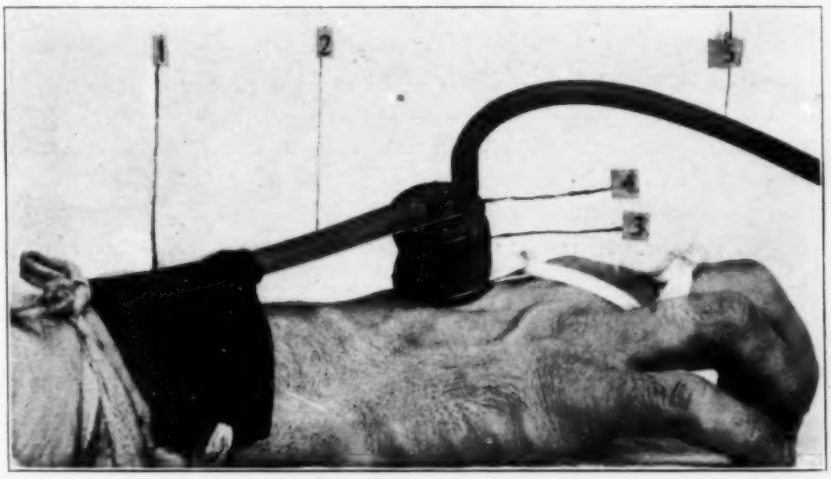

Fig. 2.—Apparatus for recording the movements of the upper limb.

larities, due to peculiarities of gait, excessive consciousness of the movements and to mechanical imperfections, shows definite characteristics, some constant, some frequent and others only occasional. It can be identified as that of a normal person.

Figure 3 shows such a record. It is typical of a large number obtained from three normal individuals (all right handed). It shows: First, that in the human being, as in the lower animals, when progression is carried out by all four extremities, there is a synchronous diagonalism, one upper and its contralateral lower limb acting simultaneously to produce the same effect, in this instance to advance the body upward and forward.

Secondly, that in this type of progression there is a period in each step when both feet are on the ground. This is also shown in the

tracings of Marey,[5] who, in his studies of a man walking upstairs, recorded the movements of the lower limbs only. The period appears to be of much longer duration in my records than in his, perhaps due to difference in inclination of the stairway or in height of the steps. This period is absent in ordinary locomotion on level ground.

Thirdly, that while the upper limb and its contralateral lower limb differ in their modes of action, they initiate and complete their action by four different movements (indicated by *a, b, c, d,* for the upper,

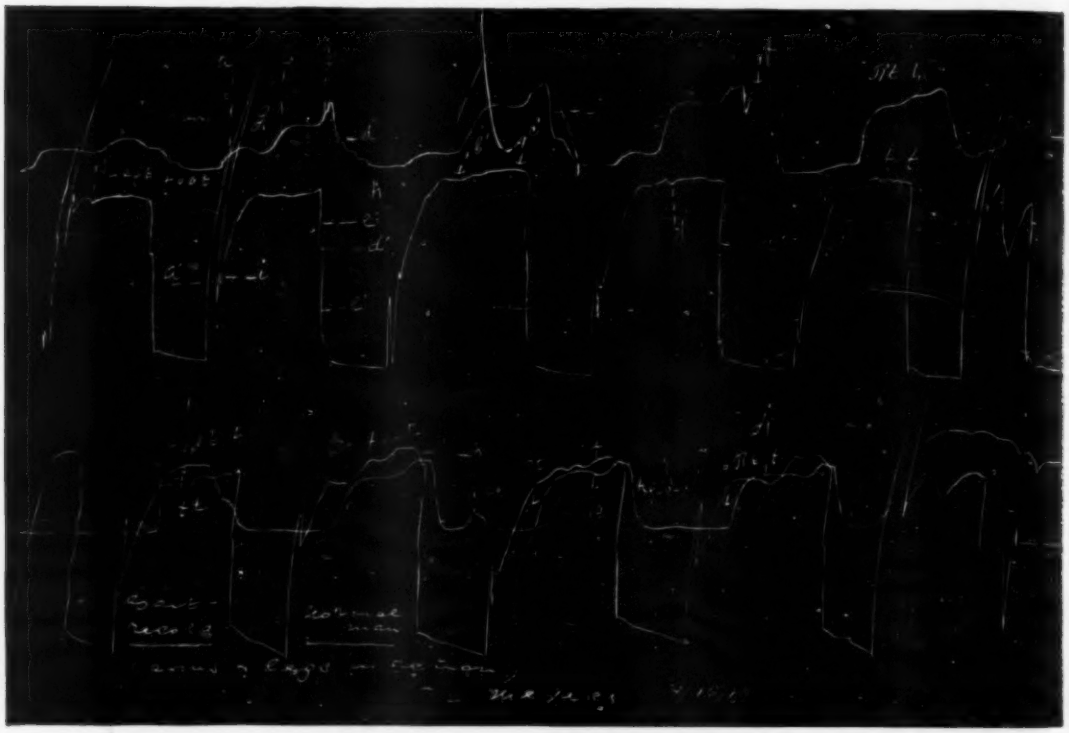

Fig. 3.—Gait record of normal man.

and *a′, b′, c′, d′* for the lower limb). These four movements in the upper limb are as follows: During the stage *a* the advanced hand gently seizes the railing. This contraction of the flexors digitorum is associated with contraction of the extensors of the wrist, the moderating synergy of Duchenne.[6] The slight extension of the wrist forces air from the chamber on the dorsum of the hand into the tambour, thus producing the upstroke of its recording lever.

5. Marey, E. J.: Animal Mechanism, New York, D. Appleton & Co., 1874, p. 127.

6. Duchenne, G. B.: Physiologie des Mouvements, 1867, p. 161.

This is followed by stage *b* (in the right-handed individuals stages *a* and *b* in the left upper limb are frequently concurrent so that one stage instead of these two, is recorded), in which the fist is clenched about the railing and contraction of the extensors of the wrist is intensified as described by Duchenne,[6] Beevor and Horsley,[7] and Hering.[8] Thus more air is forced into the tambour, resulting in a further rise in the curve. Stage *b* represents the period during which the person by a pulling effect on the railing helps to elevate his body to the step above.

Stage *c* is the period during which both feet are on the ground. The extension of the wrist now reaches its maximum, the palm presses on the railing and compression of the air chamber is at its greatest, translated by the greatest elevation of the curve. Stage *c* is terminated by a momentary relaxation in all the muscles of the upper limb, pressure on the air chamber is released, and the lever falls (*e*). During this relaxation the hand may rest passively on the railing, or it may be pendant. In the latter instance, frequently there is a very slight rise in the curve (*f*) which is due to slight extension of the wrist associated with freeing the finger from the railing. The relaxation following *c* is very brief as it is interrupted by another movement of extension, comparatively slight in extent (stage *d*) which is associated with the advance of the hand in its effort to seize the railing again with the inauguration of another step. To carry out this movement the hand not only has to advance forward and upward, but has to be elevated above the railing. This is accomplished by extension at the wrist. When the hand reaches a point above the railing, it is allowed to fall, becoming relaxed again.

Another feature shown by the record is that strong contraction of a group of muscles frequently is preceded by slight contraction of the antagonists. Thus immediately preceding the vigorous extension of the wrist in stage *b* or *c* frequently there is a slight momentary fall in the curve (*g*), which seems to indicate contraction of the flexors. This phenomenon has been described by Beevor[9] as characteristic of hysterical hemiplegia. My records indicate that it occurs to a slight degree in the normal person.

The four movements by the lower limb in executing the step synchronously with its contralateral upper, correspond with the four

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7. Beevor, Charles E., and Horsley, Victor: Phil. Tr. Royal Soc., London **178**:160, 1887.

8. Hering, E. A.: Arch. f. d. ges. Physiol. **70**:559, 1898.

9. Beevor, Charles: The Croonian Lectures, London, Adlard & Son, p. 55, 1904.

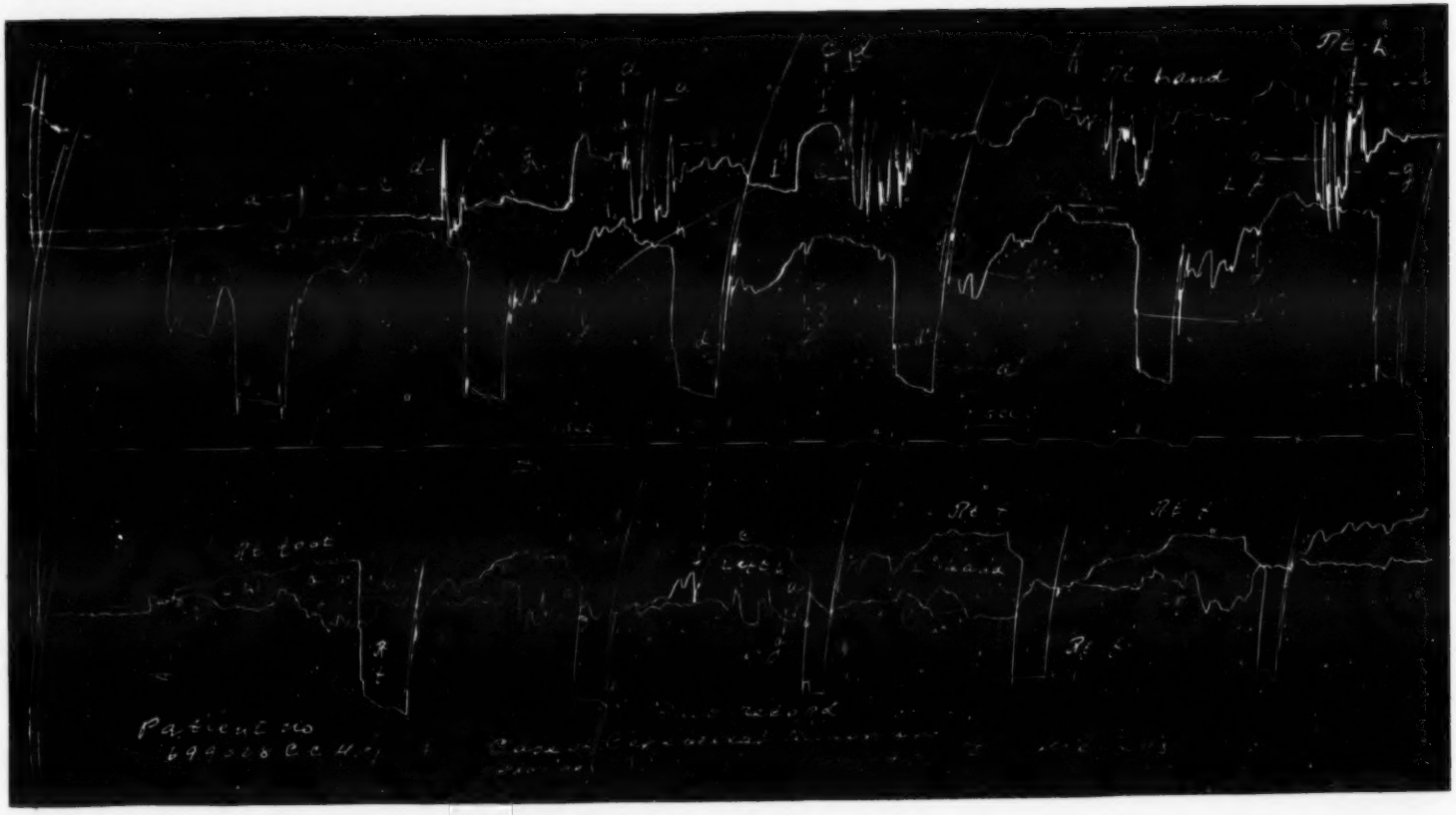

Fig. 4.—Gait record of patient with cerebellar disease.

stages, described by Philippson,[10] in the hind limb of the dog in the ordinary trot. The record shows first, the movement indicated by *a'*. During this movement the limb is extended at ankle and knee, but slightly flexed at the hip (extension phase i of Philippson) and the heel falls to the ground. This movement (*a'*), according to the brothers Weber, Pettigrew and others, may be mechanical, due to gravity and totally independent of neuromuscular activity. Thus the heel bulb is compressed, causing the upstroke on the record. The height of this rise varies, depending on the rapidity with which the foot falls to the ground. If the foot comes down quickly and strikes the ground with considerable force the lever rises far beyond the point it would reach through gradual pressure. The lever then falls (*i*), the extent varying with the extent of its original rise. (It is possible that here, too, a contraction of the antagonists may play a rôle.)

Stage *b'*, which immediately follows, is produced by a movement of extension at the hip, as the result of which pressure is exerted on both toe and heel bulbs. The foot during this stage becomes dorsiflexed on the leg (extension stage ii of Philippson). This stage is followed by stage *c'*, in which there is complete extension of the limb at hip, knee and ankle (extension stage iii of Philippson). Pressure by the ball of the foot is greatly intensified, amounting, according to Carlet,[11] to about one-fifth in excess of the body weight. This movement of extension reaches its maximum at the peak of the curve, labeled *h*, whereby the body is elevated to the level of the step ahead. Immediately preceding stage *c'* there is a brief and slight depression in the curve (*j*). This depression, I believe, results from the person exerting the pressure in two stages (*b'* and *c'*). As the weight is transferred from the bulb at the heel to the bulb at the ball of the foot the former is released more rapidly than the latter is compressed. This would diminish pressure in the tambour, causing the recording lever to fall. Still, it is possible that here, too, contraction of the antagonists may cause this slight fall.

Stage *c'* is terminated by relaxation of all the extensors, resulting in the fall *e'*, which is terminated before reaching the abscissa by another movement of extension, rise *d'*. This movement is not shown in the tracings of the gait in walking upstairs made by Marey,[5] but a repetition of Marey's experiments as well as of my own work have convinced me that the movement indicated by *d'* is one of the most constant characteristics of this type of locomotion. In fact, the tracing from a hemiplegic can at once be identified by this phase alone. It

10 Philippson, M.: L'autonomie et la centralisation dans le systeme nerveux des animaux, Bruxelles, p. 16, 1905.

11. Carlet, G.: Annale des Sciences Naturelles, Tome 16, S. 5, 1872.

(*d'*) corresponds to the moment when the foot is about to leave the ground and advance. During movement this pressure is exerted by the toes only, the ball of the foot being off the ground. (At this moment the body is supported by the other foot which in its turn has taken the step ahead.) The purpose of the movement at *d'* is probably to propel the limb itself upward and forward in the same manner as the latter, by its extension during *b'* and *c'*, propels the body in this direction—*d'* thus inaugurates the advance of the limb. The pressure at the toes causes the sole and air bulb to be bent slightly upward, thus producing slight tension recorded at *d'*. In hemiplegia, as I hope to discuss more fully in a subsequent paper, owing to the failure of the paralyzed limb to propel the body properly, the normal limb, which is in contact with the ground by the toes, assumes the burden and the extension of the limb at *d'* is greatly prolonged. Normally, immediately following stage *d'* the limb advances to the next step, i. e., to reach the second stair step above. During this phase, of course, there is no record made by this method.

My records also show that the movements on the right are generally much more vigorous than on the left; probably because all my subjects were right-handed.

THE CEREBELLAR GAIT

In the following case I was able to determine the presence of, and localize a cerebellar lesion by, the above described method when other clinical methods had failed. I should add that I knew nothing of the patient except that he was supposed to be suffering from some inflammatory process in the cerebellum. I believe that this method will be of practical clinical value and at least merits further study, although more extended investigation with improved apparatus may modify the tracings and the conclusions to be drawn therefrom.

AUTHOR'S CASE

History of the Patient.—F., aged 23, entered the Cook County Hospital, Chicago, Feb. 15, 1919, on the service of Dr. G. B. Hassin.

On Nov. 27, 1916, having been perfectly well, he awakened with severe frontal headache and dizziness and soon vomited. On rising he was very unsteady and noticed marked oscillation of the eyes. On the same day he had a discharge from one ear. A few months later his head began to tremble continually. He remained at home for four months and was then in the Buffalo General Hospital for over a year. He has somewhat improved; the headaches, dizziness, vomiting and sensation of bad odor have disappeared, but he still has tremor and unsteadiness involving head, trunk and all limbs. He also has an intermittent discharge from the right ear.

History of Symptoms.—Headache was frontal, at first severe, lasted about two years and suddenly ceased. Vomiting was at first severe, gradually grew less and disappeared with the headaches. Vertigo was bad at first; objects

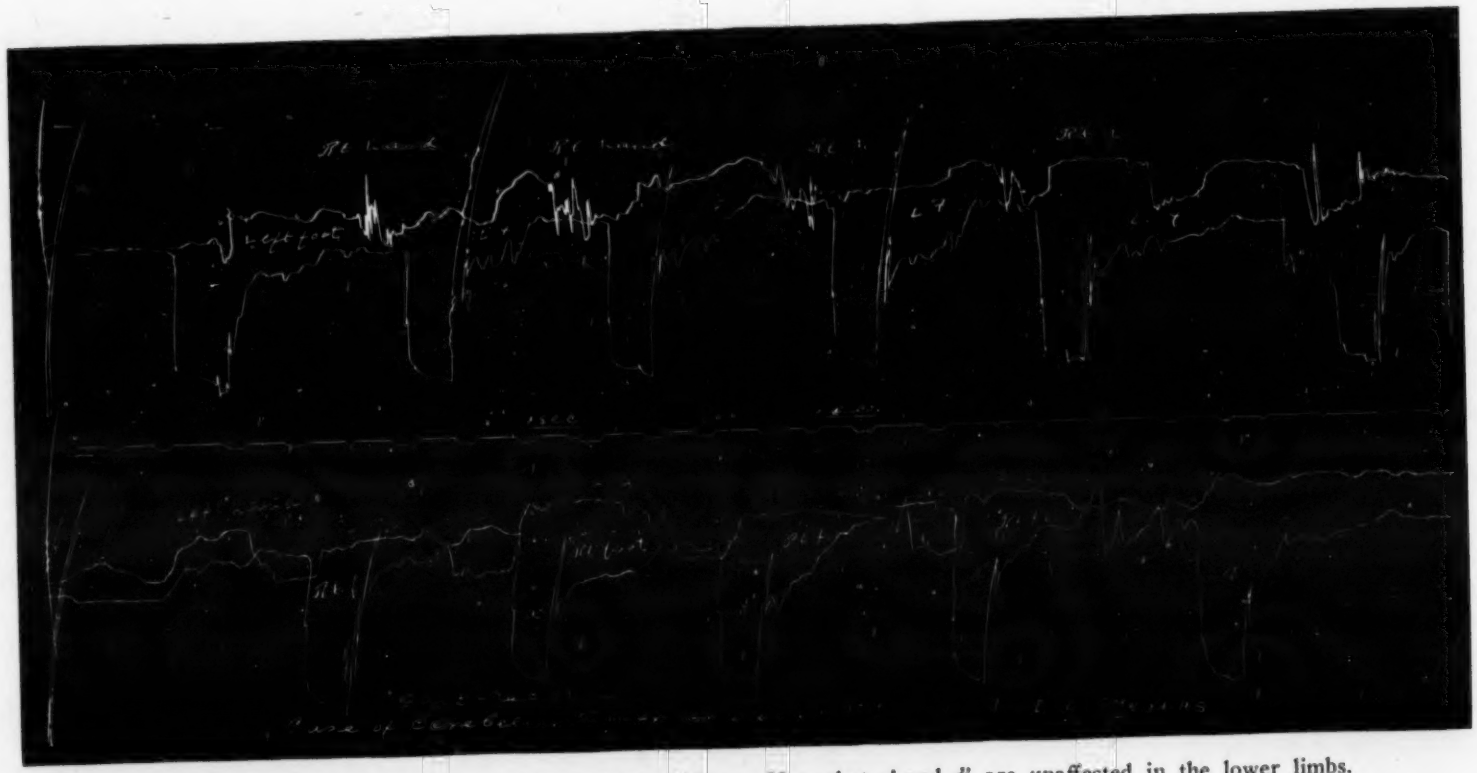

Fig. 5.—Gait record of patient with cerebellar disease. Note that *a'* and *d'* are unaffected in the lower limbs.

moved to and fro and from left to right; the body swayed, more to the right. Nystagmus has gradually grown less. Vision has always been good. Parosmia appeared with onset and persisted for twenty-three months. There have been aural discharges at intervals since onset, the last occurring about three months ago. Unsteadiness on feet has improved. Tremor of the head and body appeared with onset, was worse four months later, then less.

Examination.—The general condition was good. Abdominal and thoracic organs and genito-urinary system were negative. No paralysis, no paresis, nor sensory changes found. No atrophy; neither hypertonus nor hypotonus. The deep reflexes were rather brisk but equal on the two sides; superficial normal. The pupils were equal and normal. There was slight tremor of the tongue.

There was a general tremor, most marked in head and arms, equal on the two sides. There was also a coarse, general incoordination of the "muscle group" or extremity type. When sitting, the body and head swayed from side to side.

The patient had difficulty in rising from a chair, and could not stand or walk unaided. He had a tendency to fall in any direction, but more often to the right. The whole condition was of the "cerebellar type." Hypermetria and adiadokocinesis were equal on the two sides; asynergia not marked. Speech is slow, labored, broken.

Nystagmus is present, quick component to the right. He past points with the right hand about 4 inches to the right and with the left hand 4 inches to the left.

The otologic department reported:

1. Neither labyrinth appeared over-sensitive and the spontaneous nystagmus was not exclusively of vestibular origin.

2. The right labyrinth showed evidence of degeneration which may readily be explained on the basis of a running ear and the physical findings in the ear.

3. Positive evidence of nerve deafness on the right side.

Otherwise cranial nerves were normal. No abnormal position of head.

Laboratory examination of urine, blood and spinal fluid was negative. Roentgen-ray examination of head was negative.

Diagnosis: Infectious involvement of right middle ear, mastoid and vestibule with extension to the cerebellum. Nature and location of cerebellar lesion was undetermined; operation advised.

Dr. George W. Boot operated on April 5, 1919, exposing the cerebellum, mostly on the right, and probed the right lateral lobe. Nothing abnormal was found and the patient remained in *status quo*. Dr. Hassin then referred the patient to me and he was investigated by the method indicated in the foregoing. The tracings showed (Figs. 4 and 5):

1. During such progression there was marked tremor of the four limbs.

2. The lower limbs, in general, carried out the movements of a normal person.

3. Aside from the tremor, the only noteworthy abnormality in the movement of the lower limbs was that the relaxation immediately following the maximum extension at h, was delayed; the contraction of the extensors had a tendency to continue.

4. The changes in tracing of the right upper limb were as follows:

a. The movements of extension in stage *a*, following relaxation in stage *e*, were exaggerated to a remarkable degree. Stage *a*, was not, as in the normal

person, a maintained movement but was broken up by violent tremor into its component contractions.

b. Stage *a* set in prematurely, at a time when the contralateral lower limb, owing to its delayed relaxation, was still on the ground. This accords with my experimental results in dogs.

c. There was some exaggeration of the extension which inaugurated the stage *b*.

d. The flexion of the wrist at g, which was frequently absent in the gait of a normal person, was marked and rather prolonged in this type of pathologic gait.

e. The initial movement at *c*, following the slight relaxation preceding it at g, was also, like this movement in b, exaggerated, but not excessively so.

f. Stage d was exaggerated to a very remarkable extent.

In short, the gait records of the patient showed marked hyperactivity in the musculature of the right upper limb. Such hyperacidity was, as I have shown,[12] the essential, all-important manifestation of a cerebellar lesion. As before noted, the lobus quadrangularis and lobula probably represent the homolateral upper extremity. The head and trunk are generally conceded to be dominated by the vermis. It therefore appeared to me almost certain that the seat of cerebellar involvement in this patient was in the right lobus quadrangularis at or near the vermis. Accordingly, I advised a second operation to explore this area, which Dr. Boot was kind enough to perform on May 30, 1919. He found the lobus quadrangularis and superior lobus semilunaris near the vermis firmly adherent to the tentorium by numerous vascular adhesions. These were broken up and the profuse bleeding that followed was controlled by pressure. A flat gutta percha drain was inserted between the cerebellum and tentorium, and the wound closed.

Evidently the patient was suffering from a localized meningo-encephalitis as a result of extension of infection from his right ear.

The patient made an uneventful recovery. At the time of the present writing, four weeks after the operation, he shows marked improvement in his cerebellar symptoms. The tremor and ataxia have greatly diminished, especially in his head and upper limbs. As the cortex of the cerebellum at the site of the lesion probably has been severely damaged, complete recovery is not to be expected.

SUMMARY

The locomotor disturbances in disease of the cerebellum are shown, by the graphic records, to be the expression of two abnormalities in the action of the voluntary motor system: First, a hyperactivity of the muscles, as a result of which the movements are greatly exaggerated. The hyperactivity of the extensors is shown by the records to be especially marked when their contraction follows a period of complete relaxation. It is thus much more striking during the stages *a* and *d* which follow complete relaxation at *e*, than in stage *b* or *c* which follow the partial relaxation at *g*. In previous publications on the

12. Meyers, I. Leon: A Galvanometric Study of the Cerebellar Function, J. A. M. A. **65**:1348, 1915.

cerebellum[13] I have advanced the theory that the essential function of the cerebellum is to inhibit; to regulate the activity of the motor cortex and of the tonus centers, probably located in the medulla. This theory seems to be supported by the graphic records here reported.

Second, a tremor disturbing the smoothness of movement. A movement is brought about by the fusion of a number of successive muscular contractions. In this tremor each contraction is separated from the other by a period of relaxation. If we assume, as before suggested, that each contraction of a muscle is preceded by a slight contraction of the antagonists, it is possible that the dissolution of a movement, intended to be maintained, into its component contractions (tremor), as is shown so conspicuously during the stage *a*, is not due to alternate contraction and relaxation of the muscles in action, but to a hyperactivity of the antagonists which *precedes* each contraction of the acting group. If this theory is correct, the tremor is but a variant of the excessive activity of the muscles resulting from a lesion of the cerebellum—it is a manifestation of excessive activity in the antagonists which precedes the intentional contraction by the active group.

This work has been carried out at the Cook County Psychopathic Hospital, and I am greatly indebted to Dr. Clarence A. Neymann, superintendent of this hospital, and to Dr. G. B. Hassin, in charge of the laboratories there, for furnishing me so generously all facilities for the experiments.

25 East Washington Street.

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13. Meyers, I. L.: (Footnotes 3 and 12).

THE ACTION OF CERTAIN DRUGS ON BRAIN CIRCULATION IN MAN*

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AND
JAMES M. STANTON, M.D.
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The pharmacologic response of the brain vessels in man is a question presenting more than ordinary difficulty to experimental study, particularly under normal, nonoperative conditions. The only work of any significance in the latter connection is that of Shepard,[1] and even here the matter of specific drug effect is but incidentally dealt with — only one group, that of the nitrites, having been definitely reported. It was deemed distinctly fortunate, therefore, when the presentation of a suitable subject rendered further investigation possible.

REPORT OF CASE

The subject R. K., aged 40, a male patient at the State Psychopathic Hospital, had undergone double subtemporal decompression for the relief of increased intracranial pressure, presumably of tumor origin. The first decompression had been performed nine months, and the second, eight months prior to the initiation of this study, the patient, having by that time, fully recovered from all operative reaction. There developed residually, however, at the decompression sites, two large, pulsating cerebral hernias, each about the size and shape of a lemon. Mentally, the patient, though showing a certain deterioration, was fully capable of satisfactory cooperation.

METHOD OF PROCEDURE

Specifically, the procedure was as follows: The subject was required to lie at full length on his left side, with his face flat to the pillow, thus furnishing a level and stable support for the presenting right hernial mass, and extreme care was taken to maintain this position throughout each observation period. The site of the presenting mass was shaved and encircled by a bed of putty into which was set, so as to enclose the mass completely, an ordinary glass funnel of suitable size. To the tip of this was affixed a length of rubber

* From the laboratories of the Department of Pharmacology, University of Michigan, and the State Psychopathic Hospital, Ann Arbor, Mich.

1. Shepard: The Circulation and Sleep, New York, Macmillan Co., 1914, p. 80 et seq.

tubing, provided with a regulating T-arm, and terminating in a delicate recording-tambour of the Meister type, which was so placed as to record on a moving drum. It was found easily possible in this manner to secure a perfectly satisfactory pulse tracing. As a preliminary precaution, in order to rule out possible skin and muscle effects, duplicate appliances were affixed over the forehead, jaw, and thorax; these, however, yielded no demonstrable pulsation or other change.

RESULTS

The first drug investigated was amyl nitrite, administered by inhalation. The response was immediate and frank. There was noted

Fig. 1.—Pulse tracing showing effect of amyl nitrite.

(Fig. 1) a distinct upward movement of the lever indicative of increased volume in the part under observation, i. e., vasodilation. This was attended by a distinct increase in the pulse rate, the beat showing characteristic dicrotism. These findings were distinctly in corroboration of Shepard's.[1] They were also in agreement with Hirchfelder's[2] results, as determined through observation on the retinal and pial vessels of cats and rabbits.

The second drug studied was epinephrin, administered intravenously, very slowly and in minute, diluted dosage until effects were observed. The response to this drug, also, at every trial, seemed

2. Hirschfelder: J. Pharmacol. & Exper. Therap. **6**:597, 1914-1915.

quite definite. There was noted first (Fig. 2) a slight but distinct constriction, soon followed by a marked dilation, the reaction being characterized throughout by an increased pulse rate and amplitude. There was no demonstrable "leukoreaction" or blanching of the face, as reported by Milian.[3] It is conceivable that these results may be explained on the basis of a primary specific brain vessel constriction which is soon overcome, mechanically, by the massive reflux of blood from other more powerfully contracting centers, such as the splanchnic and limb areas. These observations seem of particular interest in view

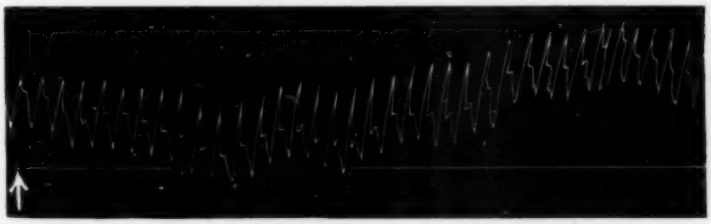

Fig. 2.—Pulse tracing showing effect of epinephrin.

of the prevailing differences of opinion in regard to the exact response of the brain circulation to epinephrin. The only available findings approaching those of the present study have been reported by Kahn[4] based on observation of the retinal vessels of cats and rabbits.

The drug next investigated was caffein — administered, intravenously, as caffein — sodium benzoate, each dose containing 3.75

Fig. 3.—Pulse tracing showing effect of pituitary extract.

grains of the alkaloid. The findings in this connection were negative — no change in rate or volume being demonstrable. Such a response is readily conceivable in the normal animal when one considers the opposite tendencies excited by caffein, to wit: bulbar vasomotor stimulation as against local vasodilation and vagus excitation as opposed to direct stimulation of the heart muscle. Still it is possible that, with greater dosage, a more definite reaction might have been secured. The

3. Milian, G.: Administration of Epinephrin, Paris méd. **8**:81 (Feb. 2) 1918.
4. Kahn: Centralbl. f. Physiol. **18**:153, 1904.

results seem to be at variance with findings by Berezin[5] and Hirschfelder.[2] Both these investigators, the former working with the perfused brain in pikes and rabbits, and the latter on the pia and retina of cats and rabbits, have reported a dilation. Roy and Sherrington,[6] however, in their volumetric studies on trephined dogs, claim an initial increase in volume followed by a decrease which, in turn, is succeeded by another rise.

The last drug exhibited was pituitary extract (pituitrin, Parke, Davis & Co.). This also was administered intravenously very slowly and in minute diluted dosage until effects were noted. In this connection there was found (Fig. 3), characteristically, a distinct though slight rise in volume, unaccompanied by any definite change in pulse rate or amplitude. It is probable that the dilation here may have the same basis as indicated in the case of epinephrin, i. e., representing a passive distention in accommodation to the generalized systemic constriction induced by the drug. It seems worthy of note that, after pituitary extract, there was observable what might be regarded as a marked "leukoreaction"—the subject evidencing a distinct greenish pallor accompanied by a moderately profuse perspiration, though complaining of no actual bodily discomfort.

SUMMARY

On the basis of plethysmographic observation on the brain circulation in man under normal, in vivo, condition, it seems that:

1. Amyl nitrite causes a marked dilation of the brain vessels.

2. Epinephrin induces a primary constriction of the brain vessels, which is followed by a marked dilation.

3. Caffein produces no demonstrable change in the dosage employed.

4. Pituitary extract is followed by a dilation of the brain vessels, accompanied by a distinct "leukoreaction."

5. Berezin: Russk. Vrach **15**:513, 1916.
6. Roy and Sherrington: J. Physiol. **11**:85, 1890.

A STUDY OF THE INVALID REACTION

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BALTIMORE

Perhaps no class of patients inflicts so much strain on the time, patience and medical wisdom of the general practitioner and specialist in every branch of the profession as persons with hypochondriac complaints who drift with the tide of every day farther and farther out into a condition of invalidism. On the other hand, it must be admitted with equal regret that no class of patients suffers more at the hands of the general practitioner and specialist than do these unfortunate members of society. If one cares to burrow into the mass of literature that has accumulated about the subject, and to separate case histories from the luxuriance of terminology and classification by which they have become overgrown, he can satisfy himself that the above statements are not exaggerated. The helplessness of efforts to serve this large body of ailing human beings seems due to a persistence in our thinking of what Adolf Meyer has called "the medically useless contrast of mental and physical."[1]

With the introduction of "neurasthenia" by Van Deusen half a century ago, herculean efforts were made to hunt down a physical basis both for its somatic symptoms referable to every system in the body, and for its "psychic" manifestations which were elastic enough to include every reaction except well-formulated types of hysteria, organic brain disease and the major psychoses. The results were set down years later by Cowles[2] of Boston in the Shattuck Lecture for 1891 wherein it was claimed that the neurasthenic suffers from an exhaustion of the nervous system in which the nutrition of the nerve cells is primarily at fault. As a consequence, there is increased irritability and fatigability on the nerves per se. Meanwhile, Weir Mitchell[3] had systematized a "cure" designed to minister to the faulty nutrition with rest, fat and blood.

But there were those in the profession who found it hard to believe that the "psychic" manifestations of the severer cases could be

1. Meyer, Adolf: Objective Psychology or Psychobiology with Subordination of the Medically Useless Contrast of Mental and Physical, J. A. M. A. **65**:860 (Sept. 4) 1915.

2. Cowles, Edward: Neurasthenia and Its Mental Symptoms, Boston M. & S. J. **125**:73 (July 23) 1891.

3. Mitchell, Weir: Fat and Blood, Philadelphia, J. B. Lippincott Co., 1884.

accounted for on the basis of actual nerve exhaustion. Among these early objectors was Janet,[4] who undertook to give a psychologic explanation for these psychopathologic facts. According to him, there is in the main a lowering of mental energy in these individuals that sidetracks productive activity into indecisiveness, obsessions, phobias, tics, etc., that are amenable to an arrangement in five groups, depending on the degree of disturbance presented by the patient. These cases Janet withdrew from the main body of neurasthenia, and called them psychasthenia. The term is still applied by the internist[5] to those cases of neurasthenia in which the "psychic" side predominates; it is applied by the psychiatrist to psychopathologic conditions associated with obsessions, fears and states of tension; and it is recognized by Freud as practically synonymous with his *Zwangsneurose* (compulsion neurosis) which he includes in the psychoneuroses. Another dissenter from the original doctrine of neurasthenia as a fatigue neurosis is Freud, who divides neuroses into physioneuroses, or *Aktualneurosen,* and psychoneuroses. Both are due to difficulties in the sexual life; the one explicable on more or less of an organic basis, or at least on the ground of a disorder of the functions; the other only on a psychologic basis. The physioneuroses consist of "true neurasthenia" with all the somatic symptoms described by Van Deusen and later by Beard. According to Freud, this is due wholly to masturbation, which, as an inadequate substitute for normal coitus throws undue strain on the energy of the individual. In fact, Freud often refers to this syndrome as "masturbation neurasthenia.[6] In contradistinction to the latter in mechanism, but also a physioneurosis, is an anxiety state characterized by a constant feeling of vague dread punctuated at times by panic attacks associated with palpitation, dyspnea, choking sensations, perspiration, etc. From Freud's standpoint, these symptoms represent accumulations of somatic sexual excitement aroused by such frustraneous attempts at satisfaction as coitus interruptus, etc. Denied an outlet they find expression in states of tension and anxiety which Freud has called the anxiety neurosis.

Throughout this nosological confusion one sees the passion to isolate, and to divide and subdivide syndromes according to whether they can be explained as physical or mental in origin. The consensus of opinion seems to hold that every somatic complaint must have a physical basis in actual nerve tissue deficit from intoxications of either fatigue or sexual substances. As to the "psychic" manifestations,

4. Janet, P.: Les obsessions et la psychasthénie **2**:7, 1911.

5. Barker, Lewellys: The Clinical Diagnosis of Internal Diseases **3**:592, 1916.

6. Hitschmann, Edward: Freud's Theories of the Neuroses. Nervous and Mental Disease Monograph, Series No. 17, New York, Moffart Yard & Co., 1913.

opinions differ. Some, by virtue of tradition, or the therapeutic ease of treatment with a formula, apparently continue to think of these psychopathologic findings in terms of exhaustion and increased nerve irritability. Others who are bolder and more energetic offer ingenious psychologic explanations for these data. All draw a definite line between functions of body and functions of mind.

The cases on which this paper is based are not presented for the sake of rehabilitating one syndrome or welcoming the passing of another; nor are they intended to stimulate controversy by the introduction of further terminology. In reviewing the case data in the table and its elaboration in certain instances, it is inevitable that one reader will see only neurasthenics, and another only psychoneurotics, while still a third will notice only the wealth of psychoanalytic material that has gone to waste. The writer has had but one idea in mind, and that is to approach each case as a problem by itself; to describe faithfully the facts that it presents, and then to study them, not for the purpose of making them fit the Procrustes' bed of an etiologic theory, or set mode of treatment, but to study them for the purpose of ascertaining what these facts mean in the patient's life. In what setting of life experiences and constitutional makeup, as well as biologic activities, do they occur? What opportunities for modification do they offer, not only from the standpoint of the individual's metabolism and hygiene, but also from the standpoint of his constructive constitutional assets, his adaptive resources, his material for instinctive readjustments? With this aim in view it becomes useless to haggle over what symptoms should be charged up to mind and what symptoms charged up to body. The main concern of the physician is, or should be, the functionating of the individual as a whole. The expressions of maladjustment in this functionating are legion. Disorders of function cover a domain too wide to be divided by such artificial boundaries as mental and physical. They manifest themselves in facts of nutrition, mentation, internal secretions, metabolism, sex conflicts, growth, feelings of inferiority, circulation, bacterial and neoplastic invasion, emotional instability, toxic processes, poor adaptive qualities, etc. Each group of facts is capable of furnishing exactly the same reliable information to the scientifically trained observer, whether it may have to be studied through the medium of behavior and life experiences as an emotional state, or whether it may have to be studied through the medium of a chemical solution, or polariscope, as a metabolic fact. In any case, hunting down the disturbance of functionating in a human being is not so delightfully simple as the public, and alas! too often the physician, seems to think, even when the patient points an accusing finger of symptoms to some group of

viscera such as the gastro-intestinal tract, for example. Campbell,[7] in his recent study of some thirty cases from the cardiovascular service of the U. S. Army Hospital at Lakewood, N. J., has shown what a complexity of factors such as "instinct, emotion and personality" are involved in many cases of disturbed heart functionating. Adolf Meyer[1] was the first to emphasize "the missing chapter of ordinary physiology and pathology, the chapter dealing with functions of the total person, and not merely detachable parts." To this chapter he applies the term psychobiology, not in contrast to, but as "a special level of biological activity."

DESCRIPTION OF AUTHOR'S CASES

These sixty cases of invalidism presented for consideration are admissions to the Henry Phipps Psychiatric Clinic of the Johns Hopkins Hospital from 1913 to 1918. Fifteen of the number were untreated through lack of the patients' cooperation. Some refused to remain because they resented being on the psychiatric service, but the majority left when given to understand that their exclusive salvation did not lie in a continuance of drug and operative therapy. Of the 45 patients treated, 16 were discharged as "well," and have had no further return of their former symptoms; 25 were discharged as "improved," and 4 as "unimproved." It was not possible to trace 11 of the "improved," but of the remaining 14, 6 are completely well, 4 are well enough to work, although they still have a few complaints, and 4 have relapsed into their former invalid condition. As to the 4 discharged "unimproved," 2 are said to be well at the present time, 1 is at another hospital, and 1 it has not been possible to trace. Among the forty-five patients treated the average duration of symptoms is five years; the average length of their stay in the hospital is twelve weeks. The ages of the entire group of sixty patients vary from 20 to 72 years. The proportion of females to males in the series is about 3 to 1.

Symptoms.—Their complaints included headache, dizziness, general weakness, nausea, vomiting, abdominal pain, eructation, "acid" stomach, diarrhea, flatulence, epigastric distress, anorexia, constipation, exhaustion, general pains and burning sensations over the body, insomnia, profuse perspiration, quivering and shaking feelings, backache, "falling spells," numbness, pseudo-aphasic attacks, and smothering and choking sensations. These symptoms occurred singly or in various combinations and permutations of distress, resulting in all

7. Campbell, C. Macfie: The Rôle of Instinct, Emotion and Personality in Disorders of the Heart, J. A. M. A. **71**:1621 (Nov. 16) 1918.

8. Cases Nos. 7 and 18 were discussed before a joint meeting of the Washington Psychiatric Society and the Maryland Psychiatric Society, March 28, 1917.

degrees of incapacitation from the cheerful ambulatory invalid quite resigned never "to know a well day again," to the individual who had practically not been out of bed for nine years.

Examination.—Every patient was subjected to the same routine examinations on admission, which are as follows: A general physical examination including a complete neurological status, and an examination of the reproductive apparatus, together with laboratory studies of the urine, blood, etc. A blood Wassermann was made on every patient. These inquiries were supplemented by consultation with other clinics in the hospital such as the dental, roentgen ray, electrocardiographic, etc., and by such special investigations as gastric analyses, blood-sugar determinations, blood cultures, etc., according as the facts of the routine examinations or the patient's individual complaints indicated further research. The psychopathologic data were derived from a record of the individual's mental status, and especially from a study of the facts of his growth and development from childhood up with particular emphasis on the constitutional makeup and reaction tendencies. The patient was then given a frank report of the results of the various examinations, and was invited to think of his incapacitation, not as a disturbance in functionating of his gastro-intestinal tract, or some other point of visceral strategy from which his symptoms seemed falsely to emanate, but to think of it as a disturbance in the behavior and activities of his whole personality; he was urged to think of his symptoms as substitutes for reactions to unhappy experiences, thwarted ambitions, petty jealousies, romantic disappointments, an empty and dissatisfied life, a desire to escape marital or domestic responsibilities, or whatever the specific facts may be. While the patient was being encouraged to educate himself in this concept, he was given the benefit of any hygienic lifts suggested by the various examinations, such as attention to the weight curve, hemoglobin, eyestrain, etc.

METHOD OF TREATMENT

Equally essential as a reconstructive factor is the ward routine arranged so that the patient gets a full and well-ordered, but not an ostensibly planned day. Following breakfast in the dining-room there are two hours in the gynmnasium and hydriatic department. The afternoon is broken into by the occupation class of an hour or more in weaving, basketry, carpentering, book-binding, etc., varied according to season and time by outdoor games, dancing and parties in the recreation hall, on the roof garden, or time spent on the campus. Between scheduled hours there is opportunity for the patient to sew, crochet, embroider, write letters, read current magazines, daily papers and library books, or to lie down if he chooses. These concrete activi-

ties not only form a sort of natural bridge between the self-limitations of the invalidism and the return to normal action and interests toward which the patient is headed, but they also restore confidence in his somatic capabilities in general, and especially in certain viscera against which he has so long nursed suspicions of incompetence. He becomes stealthily aware that he can eat proteins, carbohydrates and fats without disaster; that he can use his eyes without headaches; that he can exercise without fatigue and join a noisy frolic without collapse. And, with the knowledge that he can, comes usually the desire to do. The entire process of better adaptation is helped along by a conscientious sensible survey of the facts of the case with the physician, usually in personal interviews in the physician's office, reviewing the daily events, reactions and the observations by the nurses, giving consideration to the patient's complaint and problems, and removing them from the domain of vague self-indulgence to a reduction of concrete events and problems of the present, past or future. So much for the method of practical approach which has been employed with these patients.

In presenting the following data by table one can give only the roughest sketch of the actual facts of each case, and that sketch in a way that makes it hard to transcribe the human element in the individual situation. Each record covers the patient's age, sex, complaint and its duration, previous treatment, somatic condition, constitutional makeup, psychogenic material, condition on discharge and catamnesic data. A glance at the column of "psychogenic material" shows how varied are the "adaptations" for which the invalidism serves. The cases which follow describe a few of these mechanisms in detail.

REPORT OF CASES

CASE 1.—*History.*—No. 7 was an unmarried girl of 24 who was transferred to us from the medical service of the Johns Hopkins Hospital in June, 1916, with the diagnosis of neurasthenia. She was born in England of probably normal stock, and after a common school education took up the occupation of nursery governess. In 1913 she came to this country, and after living with her sister for a year took a nursery position in October, 1914, in a family in which she gave excellent satisfaction. While in the mountains with the family in the summer of 1915 she developed abdominal pain, nausea and occasional vomiting. She was treated for mucous colitis by a general practitioner, but without relief. In December, 1915, a surgeon removed her appendix. On recovering from the operation her symptoms returned and her employers took her to a specialist in internal medicine who treated her for hyperthyroidism without improvement. In May, 1916, she entered our own medical service where the physical and laboratory examinations were negative in every respect. She was transferred to the psychiatric service where the following psychogenic material was brought to light: The patient was a shy, sensitive child who got on so badly at home that she left at 18 to earn her own living. She came to this country in 1913 at the invitation of a married sister. On arrival she

found that this sister had left her husband and was living as the mistress of a married man by whom she was then pregnant. The patient was tremendously upset by the revelation. She brooded over the family disgrace but dared not write home about it. A sense of duty compelled her to remain with her sister until the latter's confinement. This period of mental distress was aggravated by her sister's bitter complaints of abdominal discomfort, nausea and frequent vomiting. During the patient's subsequent employment as nursemaid she was haunted by the fear that her employers would learn of her sister's disgrace, and also by the fear that her sister might again become pregnant. On the way to the mountains the following summer Pullman arrangements were such that the patient was asked to share her berth with her employer's little boy of 5 years who was a bed-wetter. She spent a tearful and sleepless night, and shortly after developed the gastro-intestinal symptoms described above, although there was no notion of an imaginary pregnancy on her own part, nor yet any conscious association of her own symptoms with those of her sister.

Course in the Hospital and Discussion.—With a thorough discussion of her relations with her sister of which she had never spoken to any one before, an elimination of the sister from the whole situation, with a reconstruction of the patient's ideas along her instinctive lines from an attitude of shame-faced mystery to a common sense dealing with concrete issues, the patient gradually lost her symptoms in six weeks. In spite of the daily routine of gymnasium, outdoor exercise, occupation class, etc., she gained 12 pounds. She was encouraged to carry out an ambition to take nurses' training which she had cherished for many years, and was accordingly discharged in August, 1916, to take up her new duties. This spring she graduates at the head of her class in the training school. The patient has never had any return of her old symptoms, or any other complaints in spite of the severe strain which she has undergone during the past three years.

CASE 2.—*History.*—No. 18 was an unmarried woman of 33 who was admitted to the clinic in July, 1916. Since 1904 she had been subject to diffuse headaches usually accompanied by nausea and vomiting, and frequently followed by "falling spells" without loss of consciousness or other signs suggesting an epileptic syndrome. At first headaches and "falling spells" came once or twice a year, but gradually increased in frequency and duration until at the time of admission they occurred once in two weeks—the headaches lasting four days. In 1911 she was obliged to give up her work as telephone operator, and from that time on had lived the life of a recluse because of her increasing invalidism. From 1913 to 1915 she was treated for epilepsy with bromids, but without improvement. On admission the physical examination was negative, including the neurological status, blood Wassermann test or any condition of malnutrition. There were no hysterical stigmata. The hemoglobin was 90 per cent. Shortly after admission the patient had two "falling spells" in which she gently slid to the floor, and in reaction to the mouth gag about to be used, said, "Don't do that, I'm all right."

Family History.—The patient's family history is negative. She was a bed wetter until 6 years old, and was always a timid and self-conscious child. She was brought up in a narrow, rigid home environment, where every normal instinct for recreation, social outlets and the expression of her individuality in any form was strictly repressed by a mother who dominated the household in every detail. The patient reacted to this atmosphere by a marked feeling of inferiority. She shrank from meeting people, seldom went out,

Author's Cases

No., Sex Age	Complaint	Duration	Previous Treatment	Somatic Condition	Constitutional Makeup	Psychogenic Material	Stay in Hospital	Discharge	Catamnesic Data
1 F (W.) 72	Headaches	12 yrs.	Drugs (delirium)	Negative	Egocentric, easily worried	None elicited	1 mo.	Unimproved	Not traced
2 F. (Sep.) 53	Headaches	13 yrs.	Rest cure; pelvic operation; operation on muscles of accommodation; calomel therapy to stomatitis	Stomatitis, anacidity, under-nourished through self-starvation	Sensitive, anxious, nagging disposition	Alcoholic husband deserted her 5 years after marriage, one son is epileptic	5 wks.	Improved	Well for 6 months, then a gradual relapse
3 M. (S.) 25	Headaches	1 yr.	Rest cure, 3 nasal operations and a tonsillectomy	Negative	Jealous, grouchy, easily slighted	Jealous of brothers, resentful toward mother for her supposed partiality; constantly at friction with employer	3 wks.	Untreated	Patient is overseas with engineering corps; no complaints
4 F. (S.) 25	Nausea, insomnia, general weakness; pains over body	2½ yrs.	Three rest cures	Negative	Insincere, whining, unenergetic	Intolerable home situation; father denied her ambitions for further educational or social outlets	7 wks.	Improved	Patient took up a business course; still has a few complaints
5 M. (M.) 52	General pains	2 yrs.	Several rest cures	Pyorrhea, Chr. prostatitis, moderate hypertension	Sly, untrustworthy, egocentric	Jealous of his wife; worry over sex irregularities, and at least one illegitimate child	1 wk.	Untreated	Not traced
6 F. (Sep.) 30	Headaches	16 mos.	None	Chronic tonsillitis; retroposition of uterus	Superficial bravado attitude; insincere	Separated from husband because she was jealous of her mother-in-law; great deal of sex tension; openly declared she used her headaches to escape thinking of the past	1 wk.	Untreated	Not traced
7 F. (S.) 24	Nausea, abdominal pain; vomiting	1 yr.	Treated for mucous colitis; thyroid disease; appendectomy	Negative	Shy, timid, "nervous" child; efficient worker	Worry over sister's illegitimate pregnancy; nursed sister who complained of nausea and abdominal pain	2 mos.	Well	No return of symptoms; patient has finished nurses' training course
8 M. (M.) 49	Headaches, weakness; stomach trouble	3 yrs.	Nasal operation	Negative	Impulsive, no self control	Great sexual promiscuity; deserted his wife; symptoms referable to sex conflicts	6 wks.	Improved	Not traced

W., widow; Sep., separated; S., single; M., married.

9 F. (M.) 43	Stomach trouble; pain and burning sensation	18 yrs.	Gynecologic operation; 9 rest cures	Roentgen ray shows dilated atonic stomach; total acidity, 45	Excitable, restless, easily worried	Onset of symptoms after birth of second child; patient is nagging and jealous of husband; has no occupation, ambition, or interests outside herself	3 wks.	Untreated	Not traced
10 M. (M.) 32	Insomnia, flatulence, indigestion, pain in heart	6 mos.	Family physician	Negative	Emotionally unstable	As a child patient was dominated by mother; his wife is shallow, takes no interest in home, neglects children, is unfaithful	7 wks.	Well	Continued well; has worked every day since discharge; no complaints
11 F. (M.) 46	Eructation pain and burning over body	24 yrs.	For hysterectomy; constant medical attendance	Infiltration of both apices	Domineering, evasive, self-centered	No interests outside her complaints; husband does not give her enough sympathy and attention	2 wks.	Untreated	Her doctor writes: "Patient looks well but begins to complain when she sees me."
12 M. (W.) 43	Weakness of legs	1 yr.	Continuous genito-urinary treatment for 1 year	Chronic urethritis	Stubborn, rigid, full of self-pity	Neisser infections, illicit intercourse with moral conflicts since death of wife seven years previous; patient made locomotion the scapegoat of his conscience	3 yrs.	Improved	Back at work, but still has a few complaints
13 M. (M.) 47	Insomnia, pain in head and back	10 yrs.	Diets and medicine all the time	Slight pyorrhea varicocele in left scrotum; total acidity, 20	Seclusive; easily worried about himself	Patient's symptoms were coincident with foreclosure of mortgage on his farm	2 wks.	Untreated	Not traced
14 F. (W.) 54	Palpitation, photophobia, throbbing over body	9 yrs.	Rest cures, bed-ridden 6 years	Low grade nephritis	Lazy, self-indulgent, hypocritical	None ever elicited; symptoms appeared suddenly after husband's return from a vacation she had opposed	3 mos.	Well	Patient does all her housework; no complaints at all
15 F. (W.) 32	Headaches, insomnia, anorexia	2 yrs.	Rest cures, drugless healer	Negative	Studious, imaginative, inaccessible	Three difficult labors; patient dreads more children; invalidism a protective rôle	5 days	Untreated	Not traced
16 M. (M.) 45	Weakness, headache, dizziness	4 yrs.	Dispensary habit; four rectal operations	Chronic nasopharyngitis	Unstable emotionally	Illiterate immigrant, 21 years in U. S.; whining, shiftless wife, 3 sickly children; constant financial struggle	5 days	Untreated	Works every day but is depressed and tearful
17 F. (M.) 32	Insomnia	3 yrs.	At least four different doctors	Underweight; Hb, 70 per cent.; achylia gastrica	Neurotic child, whining, dependent	Married against parent's wishes; continuous feud with her mother; patient disinherited; strong father attachment with depreciating comparison to husband	7 wks.	Improved, gained 12 pounds, Hb. 90 per cent.	Not traced

AUTHOR'S CASES—*Continued*

No., Sex, Age	Complaint	Duration	Previous Treatment	Somatic Condition	Constitutional Makeup	Psychogenic Material	Stay in Hospital	Discharge	Catamnesic Data
18 F. (S.) 33	Headaches, nausea, "falling spells"	12 yrs.	Bromide treatment for 3 years	Negative	No self confidence, dependent; puritanical sense of duty	Inferiority complex aggravated by narrow home environment and a hard-headed dictatorial mother; no diversions	3 mos.	Well	Patient has worked every day since discharge; no complaints
19 F. (W. 52	General acidity	6 yrs.	Diets to starvation; autointoxication therapy; tuberculosis specialists	Fibroma of larynx; undernourished; visceroptosis	Self-confident, positive	Symptoms were coincident with death of her husband; life since then has been narrow and shut-in; patient has devoted herself to nursing invalid mother and whining sisters	1 mo.	Improved	Practically well
20 M. (M.) 44	Weakness, regurgitation of food	2 yrs.	"Doctoring" for indigestion	Splanchnoptosis	Shy, sensitive, easily embarrassed, seclusive	Gradual decline of efficiency, could not hold jobs, sexual difficulty	3 mos.	Improved, gained 21 pounds. Hb. 90%	State hospital with depression for 4 months; not traced further
21 F. (S.) 56	Abdominal pain so can't walk, gas, vomiting	4 yrs.	Appendicostomy; appendectomy and resection of colon, rest cures between operations	Emaciated from self-starvation, Hb, 70 per cent.; Bell's palsy or right rectovaginal fistula	Rigid, dominating, self-righteous	No cooperation with analysis; patient's expenses are paid luxuriously by a sympathetic wealthy friend	5 wks.	Improved	Two operations since discharge, now a rest cure
22 F. (S.) 35	Restlessness, palpitation	3 yrs.	Two operations for thyroid trouble	Negative	Seclusive, reserved	Patient in love with a married man	1 mo.	Improved	Stayed at Sheppard and Pratt Hospital, now at home of sister who says she is well
23 M. (S.) 26	Weakness, stomach trouble, exhaustion	4 yrs.	Continuous rest cures, gastric lavage, diets; genito-urinary douches	Dental caries; some fibroid changes in lungs	Shy, poor mixer, sensitive, ascetic	Sex conflicts, masturbation with inferiority feeling since 14 years; obsessive tuberculosis fears; two broken engagements	3 wks.	Improved, gained 10 pounds	Well, working every day
24 F. (M.) 40	Insomnia, anorexia	5 mos.	Gynecology operation (D. and C.); rest cure	Undernourished, pyorrhea	Limited original equipment, easy worrier	Symptoms coincident with death of mother-in-law and a miscarriage; life of farm drudgery; husband a hypochondrical depression	5 wks.	Improved, gained 6 pounds	Not traced
25 F. (S.) 37	Backache, insomnia, quivering, attacks of pseudoaphasia	14 yrs.	None	Chronic tonsillitis; blind for 19 years	Ambitious, shy, sensitive	Secret rebellion against her blindness; constant worry over father's alcoholism and terrible fear of forgetting the power to visualize; resented blindness as thwarting her ambition	2 mos.	Well, gained 15 pounds	Well, complete relief from previous symptoms

26 M. (M.) 27	Dizziness	1 yr.	Different doctors	Negative	Overconscientious	Symptoms coincident with discovery of wife's pregnancy; work fretted him; lost confidence in himself	3 wks.	Well	Well, no further complaints
27 F. (S.) 26	Backache	4 yrs.	Special corset; treatment for floating kidney	Secondary anemia	Empty, evasive, uncooperative	Conflict over sex tension, erotic episode with smoothing of the incident	2 wks.	Unimproved	Well
28 M. (M.) 44	Dizziness, weakness, headache	1 yr.	None	Negative	Alcoholic, floating labor class	Married twice; first wife unfaithful; no interest outside of his complaints; craves sympathy	9 wks.	Well	Practically well, works every day but is morose and whining
29 F. (M.) 37	Headaches, exhaustion, gas	14 yrs.	Rest cure	Negative	Clinging, whining, full of self-pity, "poor stuff"	Afraid to have children; weakness coincident with miscarriage in 1900; headaches since sister died of brain tumor in 1909; spoiled by husband	5 wks.	Improved	Well, does all her housework
30 F. (M.) 31	Headaches	5 yrs.	Three rest cures, 2 nose and throat operations, 1 dental operation; oculists	Negative except for otosclerosis	Dependent, timid, craving sympathy	Worry over fear of inheriting insanity; broken engagement; jealous tendencies; dread of childbirth	9 wks.	Well	Well
31 M. (M). 58	Stomach trouble	3 yrs.	Diets, rest cures, nasal operation	Hypertension, anacidity due to limited diet	No sense of humor, sober-minded, constant worker	None elicited, talking constantly of symptoms; dissatisfied	10 wks.	Improved	Not traced
32 F. (S.) 30	Constipation, flatulency	2 yrs.	Diets, rest cure, osteopathy	Negative	Self-exacting; hypochondriacal	Complaints and substitutes for thwarted ambitions; repressed sex longings with prudishness and religious compensation	4 mos.	Well	Well, has completed library course and is working
33 F. (M.) 38	Pains in thighs and jaws and "brain"	16 yrs.	Six gynecology operations and treatments, osteopathy, electricity, teeth out	Negative	Shallow, nagging, stubborn	Symptoms followed birth of her first and only child	6 days	Untreated	Not traced
34 M. (M.) 39	Weakness, headache, insomnia	1 yr.	Family doctor	Negative	Shy, poor mixer; dissatisfied	Ambitious beyond assets; day dreams; writing plays instead of job he can do; symptoms began one month after marriage	4 mos.	Well	Well
35 F. (M.) 33	Belching, exhaustion, weakness, flatulence	5 yrs.	Two rest cures, appendectomy	Slight hypochlorhydia	Unstable, capricious, dependent	Wants no more children; strong sex desire; husband cold and unsatisfactory, no interests outside self	3 wks.	Well	Well

AUTHOR'S CASES—*Continued*

No., Sex, Age	Complaint	Duration	Previous Treatment	Somatic Condition	Constitutional Makeup	Psychogenic Material	Stay in Hospital	Discharge	Catamnesic Data
36 F. (M.) 24	Abdominal pain, backache	3 mos.	Right tube and ovary removed	Negative	Shallow, sentimental, selfish	Complaints used to avoid further pregnancies; they began after 2d abortion	3 wks.	Improved	Not traced
37 F. (M.) 42	Headaches	9 yrs.	Morphia; two gynecologic operations drainage of gallbladder	Negative	Rigid, prudish, self-acting	Headaches are club over husband, no desire for children, disappointed in life	6 wks.	Well	Well but resentful of analysis
38 F. (S.) 60	General aches and pains, twitching over body	12 yrs.	Two gynecologic operations, many doctors	Ventral postoperative hernia; dental caries	Morbid, narrow; easy worrier	Hard financial struggle; has spent life with no interests but teaching and waiting on invalid mother and sister	5 mos.	Improved	Goes about housework, but is full of complaints
39 M. (S.) 24	Dizziness, constipation, weakness	1 yr.	Family doctor	Negative except for slight pyorrhea	Suggestible, timid; no initiative	Neurotic home environment; father has gastric neurosis; probable sex conflicts	1 mo.	Improved	Not able to work
40 F. (S.) 62	Backache, dizziness	40 yrs.	Dieting and rest	Hypertension; chronic fibroid changes in lungs	Sensitive, dependent, timid	Symptoms coincident with breaking of engagement at 21 years; invalid since; symptoms worse since attack of acute Bright's disease at 40; no interests	1 mo.	Unimproved	Sanatorium
41 F. (M.) 37	Headache and acid stomach	25 yrs.	One gynecologic operation, five rest cures	Hydrochloric acid deficit of 10	Diffident, craves sympathy	Mother, father and sister all had headaches; patient jealous of sister; husband is unsympathetic; she does not want children	1 wk.	Untreated	Not traced
42 M. (S.) 34	General "poor health"; weakness	All life	Was taking nine different medicines on admission	Negative	Morbidly self-centered, full of self-pity	Patient was brought up to believe he was delicate; was taken out of school, was not allowed to work	1 wk.	Untreated	Not traced
43 M. (S.) 26	Weakness on exertion, pains all over	8 yrs.	Dispensaries	Left inguinal hernia	Erratic, never could hold a job	Patient had two schizophrenic breaks at 18 and 22 years, probably using his complaints to keep him from work; masturbation; worry	2 mos.	Improved	Not traced
44 F. (S.) 48	Headaches, vomiting	1 yr.	Rest cure, daily gastric lavage for 1 year	Negative	Inclined to self-pity, craves sympathy	Symptoms coincident with hard nursing case; life of drudgery to support mother and sister; no recreation or emotional outlet	6 wks.	Well	Well

45 M. (M.) 52	Weakness, exhaustion	6 yrs.	Rest in bed	Negative (hay fever)	Conscientious, sensitive, easily discouraged	Heavy financial burdens; marital incompatibilities	4 mos.	Untreated	Not traced
46 F. (S.) 41	General aches and pains; cannot use eyes	8 yrs.	Two rest cures; 1 gynecologic operation, electricity	Refraction error; anacidity	Sensitive, immature, stubborn	Symptoms coincident with father's death in 1910; autoerotism with worry	3 days	Untreated	Not traced
47 F. (S.) 26	Pressure and pain in head	5 yrs.	None	Undernourished; poor hearing in left ear	Somatically interested, dependent, craving sympathy	Symptoms associated with fear of high blood pressure; they developed at time of brother's engagement as partial adaptation to elicit sympathy and prevent his marriage	6 wks.	Well	Well
48 M. (S.) 36	Weakness	7 yrs.	Two rest cures; 1 nasal and throat operation; operation for gastric ulcer (not found); dispensaries	Negative	Self-centered	Patient's mother, brother and sister are invalids of neurotic type; does not want insight into illness; his disability insurance runs on; he insists on rest	1 mo.	Untreated	Took a rest till insurance stopped; is now working but full of complaints
49 F. (M.) 40	Sweating, burning, aching	5 yrs.	Two operations, (perineal repair, hemorrhoids, appendectomy) osteopathy	Negative	Stubborn, lazy, self-indulgent	Financial reverses; no desire for children; symptoms appeared after last pregnancy	4 mos.	Improved	Not traced
50 M. (M.) 39	Headaches	2 mos.	Dispensaries and outside doctors	Pyorrhea; impairment of hearing	Neurotic; Russian Jew type	Sympptoms coincident with abscess in throat, and parents leaving city; father has headaches; financial straits	5 wks.	Improved	Well, working steadily
51 M. (M.) 35	Dizziness, weakness in limbs	1 yr.	Medicine and rest	Accidental loss of eye in childhood	Sensitive, introspective, easily hospitalized	Constant fear of disease; symptoms coincident with mother's death	8 mos.	Improved	Not traced
52 M. (S.) 33	Belching, indigestion	12 yrs.	Various doctors	Negative	Neurotic child, backward, sensitive	Marked inferiority feelings with autoerotism; father is a gastric invalid	6 days	Untreated	Not traced
53 F. (M.) 29	Pain around heart; stomach trouble	7 yrs.	Gastric lavage every 10 days for 3 years; two gynecologic operations	Negative	Precise, hypochondriacal	Symptoms coincident with jealousy of husband; complaints called for his sympathy and attention	5 mos.	Improved	Complaining but able to get about her home duties
54 F. (M.) 35	Stomach trouble, weakness	2 yrs.	One gynecologic operation	Negative	Dependent, weakling	Eight periods of invalidism of from 2 to 3 months since 17 years	7 wks.	Improved	Not traced
55 F. (M.) 39	Shaking and quivering	10 yrs.	Medicines and doctors	Negative	Insincere, evasive	Worry over daughter's mental breakkdown	2 wks.	Improved	Well, no return of symptoms

AUTHOR'S CASES—*Continued*

No., Sex, Age	Complaint	Duration	Previous Treatment	Somatic Condition	Constitutional Makeup	Psychogenic Material	Stay in Hospital	Discharge	Catamnesic Data
56 F. (S.) 20	Nausea, belching, epigastric pain	3 yrs.	Treated for stomach trouble	Negative	Lazy, stubborn, overindulged	Symptoms coincident with having her teeth out, would not have new ones, sensitive	6 wks.	Improved	Works every day but still enjoys a few complaints
57 F. (M.) 30	Pain in side	2 yrs.	One gynecologic operation; treated by six doctors for gastric ulcer and Dietl's crisis	Negative	Jealous, subject to temper tantrums, vain, shallow	Anxiety neurosis at 15 years; pain spasms precipitated by tantrums with husband; latter has been promiscuous since marriage	5 wks.	Well	Well
58 F. (S.) 25	Smothering feeling	5 yrs.	Various doctors	Secondary anemia, visceroptosis, deflected nasal septum	Lazy, full of self-pity, rigid, pretentious	Symptoms coincident with broken engagement; disappointed educational ambitions; parasitic life for last 3 years; no desire for insight	3 wks.	Untreated	Not traced
59 F. (S.) 35	Headaches, weakness, pains in eyes	10 yrs.	Various doctors	Hemoglobin 60 per cent., undernourished	Shy, always complaining, easy worrier	Autoerotism for 10 years; feared insanity from habit; invalidism a compensation for an idle, unsatisfactory life	2 mos.	Well, gain in weight and Hb.	Well
60 F. (S.) 30	Pain in back, side and stomach	2 yrs.	One operation (appendectomy)	Chronic otitis media	Self-indulged, clinging, craves sympathy	Patient curled up in presence of earning her own living, and has found it easier to live on sympathetic friends	2 wks.	Untreated	Not traced

suppressed all interest in the opposite sex in conformity to her mother's wishes, and feared to take responsibility so that she refused several chances to advance while working as telephone operator. The patient's first "falling spell" occurred in 1904 when at the time of the Baltimore fire she came unexpectedly on the charred body of a neighbor. For the next three or four years these attacks and headaches always followed some exceptional physical or mental strain, but from 1910 they occurred irrespective of any unusual circumstances, seeming to represent the patient's only means of getting square with an intolerable home situation.

Course in the Hospital and Discussion.—In going over matters with her these facts were clearly pointed out. She was told that there was no organic basis for her complaints, that they were expressions of her inner conflicts and dissatisfactions, and that the solicitude and sympathy called forth by her affliction probably satisfied in a large measure her natural craving for affection and the expression of her individuality. She was shown the necessity of gradually reconstructing her life along the lines of reaching out toward new outlets in the cultivation of friends, social interests, recreation, and above all some occupation which would give her satisfaction. The patient was discharged in October, 1916. She has never had any more "falling spells." The headaches have decreased, so that she has had but seven or eight attacks a year, and only one of these has been severe enough to keep her from an eight-hour day at the office where she has been employed since leaving us. She has been boarding in a congenial place in town, and has taken up various social activities. On her own initiative she has been attending regular classes at night school during the past winter with the view of improving her position.

Case 3.—*History.*—No. 30 was a married woman of 31 who was referred to us in October, 1917, by Dr. Louis Hamman of Baltimore, whom she consulted because of headaches of five years' duration. The patient's mother is an erratic, nagging woman subject to temper tantrums, but aside from this the family history is negative. At 4 years of age the patient had a "fever" followed by a deafness which has grown progressively worse. At 19 she graduated from a normal school, after which she lived at home, substituting in local schools, but unable to get a permanent position on account of the deafness. In June, 1917, she married, but has not been pregnant. The patient's headaches began in 1912 shortly after hearing that her soldier brother was shot in the Philippines. She was sleepless, and lost her appetite, but put on a "bold front" plunging into athletics (tennis and golf) until she collapsed with "exhaustion" several months later. The attending physician put her to bed for nine months with absolute rest and forced feeding, hinting darkly at tuberculosis. During this rest cure her father died, and a brother returned from the West to die at home of tuberculosis. In August, 1914, becoming nauseated from milk and eggs (as she said), the patient got out of bed and consulted another physician in a distant city. He told her she had "thyroid disease." The patient returned home, continued to have headaches on the slightest exertion, and worried constantly about herself. From May, 1915, to November, 1915, she sought health in the mountains of North Carolina, but found a nose and throat specialist who promised instant relief from a drainage of the right antrum. This operation, however, caused no improvement. In April, 1916, she had a tonsillectomy, also without relief. In July, a dentist treated her for "pus pockets" and an impacted wisdom tooth. This, too, was a failure so far as relief from the headaches was concerned. The patient then began to consult oculists, four of whom changed her glasses. At that time,

she consulted Dr. Hamman and was recommended to the clinic. She could not read, sew or take exercise for fear of inducing a headache, which appeared on an average of once a week and lasted for twenty-four hours.

Physical Examination.—This was practically negative except for otosclerosis. There was a slight retroflexion of the uterus. Her glasses corrected a moderate astigmatism, myopia and some weakness of the internal recti muscles.

Constitutional Makeup.—The patient had always been self-centered, inwardly dependent, craving sympathy and attention, and full of self-pity, but outwardly altruistic and bluffing. The deafness has tended to increase her sensitiveness and to limit her activities and ambitions.

Psychogenic Material.—The following psychogenic material was brought to light during a study of the case:

1. The patient had never been able to face the fact that her soldier brother shot himself in the Philippines instead of being killed by natives as the family advertised. She felt that he had inherited insanity from her mother, who has violent temper tantrums. And if he had inherited it why should not she? Her headaches were interpreted vaguely as a possible forerunner of mental disease. A friend dying of brain tumor had complained of headaches.

2. The patient had always been overshadowed by a handsome, sparkling sister of whom she was secretly jealous. This sister received more attention in society than the patient. The latter felt not only slighted, but had marked feelings of inferiority based on her deafness. Even after marriage when she and her husband were boarding the patient was sensitive to her husband's attempts to make himself agreeable to others in the household.

3. During the beginning of invalidism the patient had been undecided whether she should marry a wealthy man to whom she was engaged, or her present husband who was struggling to rise in his profession. She did not love the first man but felt he "understood" her better (i. e., gave her more sympathy and attention), and would be better able to provide for her comfort.

4. The patient hesitated also about the whole question of marriage because she did not want children. She said it was because she feared they would inherit her "tendencies to insanity." In reality she feared childbirth because a sister had died of Bright's disease during pregnancy. Since marriage every doctor had told her she was not strong enough to have a child—at least, until her headaches were better.

Course in the Hospital and Discussion.—It is scarcely to be wondered at that the patient had been willing to remain passive toward her decisions and problems and to accept medical excuses that involved no effort on her part toward remedying matters; but it is a matter for marvel that after five years of invalidism under careful therapeutic supervision she had moral force enough to turn squarely about and face her difficulties frankly. Four weeks from admission she was reading books and magazines, embroidering, exercising in the gymnasium and taking three lip-reading lessons a week which were advised as a lift to make her more at ease in meeting people without embarrassment from deafness. The patient was discharged ten weeks from admission comparatively free from headaches, and eager to take a fresh start. She reports to the physician from time to time. Since leaving the clinic she has been doing all her own housework, much of her sewing, and has been going out normally with pleasure and satisfaction. Of her former complaints she says: "Yes, I have headaches sometimes, but they don't bother me any more. I can always find the reason why they came on that day."

One often sees invalidism growing like a fairy weed out of some stray seed of somatic disorder such as hypochlorhydria, retroflexion of the uterus, visceroptosis, a mild pulmonary tuberculosis, etc. With the disturbance corrected one would suppose the patient would give up his complaints. Not at all, he harps on them more than ever. The physician thinking he must have overlooked something, and goaded by the feeling that he ought to be "doing something" about all this distress, sends the patient from one specialist to another. It never occurs to physician or family to ask Of what is the patient making his complaints the scapegoat? Is it conscience, or instinct, or a natural tendency towards inertia? Why is it that this patient with a mild degree of visceroptosis is collapsed in bed with a special nurse, when another individual whose roentgenogram shows a stomach almost to the pelvic brim accomplishes a good day's work with a maximum of enjoyment and a minimum of discomfort? Obviously, we are dealing with a situation too complex to be explained by the visceroptosis. The following case is illustrative of this type of invalidism:

CASE 4.—*History.*—No. 23. A single man of 26 was admitted to the clinic in May, 1918, complaining of exhaustion, weakness, stomach trouble and fear of tuberculosis. The family history is negative. As a child the patient was timid and retiring, and shrank from every contact that might embarrass him. He finished high school at 16, graduated from college at 20, and began professional school which he left at 22 because of the present illness. Following an attack of bronchitis in April, 1914, one doctor told him he had tuberculosis and should give up his work; while others told him he was well and should continue it. The patient compromised by going West on a ranch to rest. He was, as he had been all along, afebrile and symptomless. In May, 1915, he had diphtheria, following which he had an afternoon rise in temperature to 99 F. for several months. In August, 1915, a doctor told him he had râles in both bases. In November, he went to a sanatorium where he stayed until February, 1916. The doctors here could find nothing wrong with him, but kept him in bed most of the time. In December, 1915, he complained bitterly of "heaviness" and acid eructations after eating; June, 1916, found him at another sanatorium where his physical examination was found to be negative. A gastro-intestinal specialist, whom he consulted in December, 1916, found hyperacidity, and put him on a "mild diet" and daily gastric lavage which the patient continued until June, 1917, when another specialist advised him to discontinue the performance. He did so and gained 20 pounds. In February, 1918, he consulted a genito-urinary specialist for nocturnal emissions, and began a course of treatment consisting of instrumentation and injections of protargol.

Physical Examination.—Physical examination at the clinic after admission showed dental caries, fibroid changes in the lungs but no active process, a slight hydrochloric acid deficit, and a hemoglobin of 73 per cent.

Psychogenic Material.—This consisted for the most part of a life-long sex conflict. At 14 the patient began the habit of masturbation, accompanied by feelings of sin and degeneracy. He brooded over the habit, felt that it was ruining his health, and thought that people could read it in his face. Through school and college he was a poor mixer, refusing invitations to join fraternities

and clubs, and restraining himself from making friends. He did not go in for athletics because he felt that the masturbation made him physically inferior to other men. From 1910 he was engaged to a girl who finally jilted him in the summer of 1917. The engagement period was one of a great deal of frustraneous excitement with numerous sexual episodes, following which there were exacerbations of autoerotism with tremendous worry and religious conflict. Each emotional and instinctive upheaval was associated with showers of somatic complaints. For example, the onset of the gastric symptoms in 1915 was coincident with the patient's fiancée throwing him over the first time.

Course in the Hospital and Discussion.—During the patient's three weeks in the hospital he gained 10 pounds. He was given the benefit of attention to the teeth, hypochlorhydria and hemoglobin. He was encouraged and reassured as to his physical condition and urged to prove his strength by walking and other exercise. At the same time the patient was shown how his fears of tuberculosis and his gastric symptoms were merely expressions of his instinctive conflicts. Into these facts he showed remarkable insight and availed himself of opportunities for frank discussion of his difficulties and of further suggestions for self-development. Since leaving the hospital he has been teaching physical training, and expects to resume his professional studies another fall.

Case 5.—No. 14 is an example of the invalid from whom the physician cannot extract any psychogenic material although he is absolutely certain of its existence. These patients are usually persons who have indulged in life-long habits of mental dishonesty. Their life is "an open book" in which there is not a page of the past or present that they would not gladly have read. This insincerity of attitude is not infrequently glossed over with a superficial enthusiasm and interest in religion, philanthropy and the humanities, resulting in a surface so smooth and shining as to be disastrous to any honest attempt to get at the facts beneath. Curiously enough these patients often make good recoveries as in the following case, whose return to normal activities was due almost wholly to the training of the ward routine under stern and rigorous supervision. The case is significant not only because its outcome was not dependent on analytic lifts, but also because the invalidism itself was associated with a mild somatic disorder more or less chronic.

History.—The patient was a widow of 54, who was admitted to the clinic in June, 1917, complaining of headache, numbness, throbbing all over the body, epigastric pain after eating, and extreme sensitiveness to light and sound. Little was ever elicited in the way of family history or past history. The patient taught school for ten years previous to her marriage at 30. Friends describe her as "easy going" and inclined to self-indulgence and evasiveness. Her four children are bright and healthy. The present illness began nine years previous to admission. On the return of her husband from several months' vacation (the patient had opposed this trip), the patient took to her bed with all the above-mentioned complaints, though she seemed to be in good health up to that time. Her husband, who was a physician, sent her to a sanatorium for several months' rest cure. On her return she continued it until she was bedridden for six years before admission, causing herself to be isolated in quiet country places. During her invalidism she took no interest in reading, current events, domestic affairs or handiwork. She lay quietly in bed in a room darkened by closed blinds and drawn shades.

Physical Examination.—This revealed carious teeth and some edema of the feet and legs. The urine had a trace of albumin with a few hyaline casts.

The phenolsulphonephthalein test for renal function was 52 per cent. in two hours. Blood pressure was 135-85.

Psychogenic Material.—No information was ever obtained from the patient as to personal difficulties, or the setting in which her symptoms began. She always spoke of her husband with affection. He was a remarkably perfect man. Her children were ideal, and she the most devoted of mothers. When one applied to this devotion the touchstone of the fact that she was quite willing to deprive them of educational advantages and use the money to foster her invalidism, the patient glided easily into religious platitudes. Her sickness was "God's will." She had no worries or regrets "because I am a Christian."

Course in the Hospital and Discussion.—The patient refused dental attention. She was put on a low protein diet following which the edema disappeared and the blood pressure fell to 125-76. Although the patient never gave up her attitude of martyred suffering and her religious defenses, it was possible to pry her apart from her invalid habits one by one. The shades at the windows were raised, her blue glasses and the cloth over her eyes were removed. The cotton was taken from her ears. She was made to get out of bed, to walk first about the ward, and later over the building. She was required to take up handiwork, and be responsible for the reading of daily current events in the papers. At first constant vigilance on the part of the physicians and nurses was necessary to keep the patient from dodging these concrete occupations. No opportunity was lost to make it clear to her that she was using her invalidism as a means of escaping the responsibilities of life. While she did not respond to such proddings with denial or even resentment, it was noticed that she gradually showed more spontaneity in getting into the swing of activities. On discharge three months after admission, the patient was enjoying a full ward day. Since returning home she has taken up the management of the household, doing most of the housework herself.

Another type of invalid not only discouraging from the standpoint of presenting a "dry tap" so far as psychogenic material is concerned, but also discouraging from the standpoint of modifiability, is a patient like No. 38. These persons manage to adjust themselves somehow or other to the obstacles that confront them on the journey of life until they get to a certain point which very frequently is middle life. This adjustment has always been more or less superficial. In fact the patients seem constitutionally self-centered, having no healthy, robust interest in, or knowledge of, the world around them except indirectly through the medium of their family or own narrow circle of friends. A petty ailment in themselves or their families, a disappointment, or even a slight domestic inconvenience plunges them into a worry and fussing out of all proportion to the discordant element. As they approach the fifties, and the area of their interests and satisfactions becomes progressively more circumscribed—perhaps by the death of husband or wife, or the marriage and leaving home of children—they fall into a monotonous harping on vague somatic complaints for which they travel from one doctor to another. As therapeutic problems for

modification they are difficult, indeed. Robbed of their complaints the emptiness of life leaves little to which one can bring them back, and life-long poverty of interests makes it almost impossible to open up new avenues of satisfaction as substitutes for the old unhealthy reactions. The hospital regimen improves them a bit, but no sooner are they out than a slump is well-nigh inevitable.

CASE 6.—*History.*—The patient, a single woman of 60, was admitted to the clinic in May, 1917, complaining of jumping and twitching sensations in her arms and legs, pains in her eyes, and a "hollow feeling in her liver" that forced her to take great sighing breaths. As a child she had night terrors. At 18 she graduated from high school and had taught in public schools for twenty-five years until retired on a pension in 1909. At 18 and 20 years of age she had attacks of "neuritis" in her head and neck. In 1906 she had uterine fibroids removed, and in 1909 she suffered a panhysterectomy. The patient was always sensitive and inclined to worry over physical ailments for which she was continually consulting doctors. Since 1916 she had been complaining as on her admission to the hospital.

Physical Examination.—This revealed a postoperative ventral hernia, injected tonsils and decayed teeth.

Psychogenic Background.—The patient took no interest in any attempt to analyze the situation in which her invalidism occurred. She had spent all her life teaching in the grades, and caring for an invalid mother and sister. Since her retirement from teaching she had lived in an out-of-the-way country spot with her sister. Her life had been devoid of interests and satisfactions outside her own home circle. She had cultivated no outlets in the way of reading, recreation or social intercourse. Everything in her manner of living had tended to foster her innate tendency to withdraw from the outside world into herself.

Course in the Hospital and Discussion.—The patient refused dental attention. The gynecologic consultant thought the ventral hernia quite insufficient to account for her complaints, and recommended an abdominal support. During her five months in the clinic she gained 20 pounds, and slept without difficulty. She showed oscillations in her complaints according to how vigorously she was prodded into activities. Any mention of a time limit to her stay in the hospital was sufficient to precipitate them in showers—she became tearful, and would declare she had come "to be cured and not helped," and thought her case ought to be tried out for eight months. At other times the patient would show an easy, placid hospitalization. There was never any acceptance of the obvious adaptive rôle of her invalidism. Since leaving the clinic she has been living at home. She makes her usual complaints but apparently is able to adapt herself to some household duties.

The above records represent merely a few of the psychobiologic twists for which invalidism may be a substitute. Each case in itself is a problem for study. The physician's task is not at an end when he has brought to light the psychopathologic facts underlying these cover reactions. Why is it that ordinary "slings and arrows of outrageous fortune" cause a break in the adaptive compensation of these particular individuals? And why should this break in compensation

take the form of an invalid reaction rather than one of the major psychoses? These and kindred questions involving a working knowledge of the problems of psychobiology should be a part of the medical equipment of every practicing physician as much as materia medica. A glance at the medical profession's groping efforts after salvation recorded in the "previous treatment" column of the appended table is enough to convince the most prejudiced of this necessity. As servants and medical advisers of the public it is our duty to study carefully *all* the facts of individual disease brought to our attention, and to base an opinion on these facts unbiased by the habit training of a specialty or the conservatism of tradition.

STATUS LYMPHATICUS: ITS OCCURRENCE AND SIGNIFICANCE IN WAR NEUROSES

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In the study of the psychoses, perhaps most particularly in the study of dementia praecox, the investigation of the makeup of the individual has meant great progress both as regards broad lines of diagnosis and sympathetic understanding of individual cases. These studies of makeup can be said to be preponderately along psychic lines. They are actually personality studies, and as such sometimes include a general survey of physical factors. However, it is fair to say that usually the psychic tendencies are studied without even a recording of the physical traits to be correlated with them. Considerations of this sort regarding a recognized advance in the study of a psychotic type, contemporaneous with meeting for the first time in fairly large numbers cases of war neurosis, led the writer to study makeup in connection with the occurrence of the war neurosis. However, the study of the personality in these cases was not undertaken, the psychic makeup was not established and no conclusions drawn from that realm. The investigation was frankly restricted to the physical. Perhaps the fact that the war neurosis is new only as regards its physical stage setting made it natural to look at the physical attributes of its victims. The physical attributes searched for have been those that occur in the condition which is called status lymphaticus. These physical signs will be enumerated and their bearing on the war neurosis discussed. Unfortunately, the concept status lymphaticus does not in every sense bear scrutiny and the writer is anxious to disclaim having found cases that displayed all of the signs of the reputed syndrome. I will try later to state the contradictions that occur in the establishment of this syndrome. In this study such cases as have been given the diagnosis of so-called status lymphaticus show unquestionable and precise signs of internal glandular disturbance and the type, whether given the name of status lymphaticus or not, becomes quite significant. The purpose is to show the large occurrence of this type of individual among cases of war neurosis and to say that this finding adds new importance to the physiologic factors in the etiology of the war neurosis.

PHYSICAL FINDINGS IN STATUS LYMPHATICUS

The physical findings said to exist in status lymphaticus can be stated according to systems of the body. The most widespread relate

to the lymph tissue; the most debatable to the circulatory system; the most numerous affect the bones; the most conspicuous relate to the skin.

First, in regard to the skeletal frame: In status lymphaticus, it has been said that the skeleton shows undue slenderness of the long bones, a narrowing and lengthening of the thorax, prominent and winged scapulae, relative increase in the antero-posterior measurement of the skull, lordosis, a widening of the pelvis and arching of the femur. Secondly, there is presumably a hyperplasis in the lymph system with generally enlarged glands and increased lingual, tonsillar and pharyngeal lymph tissue; also, the lymph nodes of the intestinal tract are hyperplastic, the spleen enlarged, the thymus persistent and of undue size. Thirdly, in the circulatory system small caliber of the arteries, especially of the aorta, and a small heart are supposed signs of status lymphaticus. Fourthly, the skin and its hairy developments, according to the syndrome, show characteristic features. The skin in these cases is velvety and of a feminine delicacy, and the hairy growth approaches or reaches the feminine type in amount and distribution. The hair of the head is abundant, however, and only that on the body is scanty. The deficiency amounts to a very thin growth of hair on the upper lip, absence or great scantiness of hair elsewhere on the face, absence of hair on the chest or about the nipple, pubic hair scanty in amount and with a horizontal delimitation along its upper border and not ascending in the midline to or toward the umbilicus. Finally, in a different sphere congenital anomalies of the reproductive organs are said to be common. Largely as a result of the combined skeletal findings and the nature of the skin, there is often a rounding of the contour of the body so that femininity is again resembled. This is supposedly most noticeable in a rounding of the upper arm.

Haven Emerson, in 1914, published some studies on status lymphaticus. To the exclusion of many of the symptoms mentioned by former writers, he came to the conclusion that the diagnosis of status lymphaticus rests on scantiness or absence of hair on the lip, chin and cheek, scantiness of axillary hair, together with the feminine type of pubic hair, a tendency to narrowness and abnormal length in the thorax, a noticeable rounding of the thighs, a rounding of the upper arm, and a markedly velvety skin. Emerson concluded that there is no consistent parallel occurrence of such features as an increased relative length of skull, prominence of the scapulae or lordosis. These skeletal findings were not more frequent among markedly hypotrichotic cases than among cases of an opposite type. The heart and arterial changes were not found to occur in any convincing percentage, nor were the genital abnormalities found. He excluded changes in the lymph glands

for the reason that they are subject to too many extraneous influences. The spleen was not enlarged in his cases and the thymus was not tangible.

AUTHOR'S OBSERVATIONS ON TWO GROUPS OF SOLDIERS EXAMINED

I examined cases along all the lines mentioned by the earlier writers, but I agree with Emerson that the lymph system findings are not suitable for classification one way or the other. I obtained figures to show that no circulatory or genital findings are characteristics of the condition, and that neither are a majority of the reputed skeletal signs. In virtual agreement with Emerson, the writer comes to the conclusion that the only features that are persistent and mark the type and without which the condition cannot be said to exist are: extreme scantiness of the hair of the face, trunk and extremities, a feminine type of pubic hair and a velvety skin. Emerson does not speak of an abundance of scalp hair in contrast to the hypotrichosis elsewhere, but the writer found it in a majority of the cases and believes this is a feature of the picture. In addition, there was found in the majority a tendency toward the long, narrow type of chest and, likewise, a tendency toward a slenderness of the long bones. To repeat, the writer uses the term so-called status lymphaticus to describe this restricted syndrome — bodily hypotrichosis in contrast to abundance of hair on the scalp, feminine type of pubic hair, velvety skin, a tendency toward abnormal length and narrowness of the thorax and slenderness in the long bones. And it is worth while at this point to note that in a male the signs of so-called status lymphaticus are those which constitute a partial heterosexualism.

The cases examined were two groups — one a group of psychoneurosis cases, and the other a group of surgical cases. The psychoneurosis cases, numbering 114, were seen in Ward 55 of U. S. General Hospital No. 1, and were cases of psychoneurosis that developed in American soldiers on duty in France, the huge majority of them going through trench warfare. They were unselected cases and to a large degree were merely consecutive admissions. The psychoneurosis diagnosis was made by the psychiatric staff, presided over by Major George H. Kirby. The other group of cases — 119 in number — were surgical cases, all battle casualties, examined at U. S. Debarkation Hospital No. 3. The patients were soldiers who had gone through front area duty and who had not developed war neurosis. They likewise were entirely unselected. They were not consecutive as regards admission to the hospital, but were either seen in the course of examination for organic nerve injuries or taken, at random, in various wards, all the patients present in a ward being examined without

discrimination. Both groups were of enlisted men and included no officers.

The two groups, then, were of soldiers sharply contrasted, it can be claimed, in their reaction to modern warfare. Were these groups similarly in contrast when judged according to the status lymphaticus syndrome? The hypotrichotric individual with feminine type of pubic hair, with a feminine velvety skin, slenderness of the long bones and a narrowness of the thorax, was found virtually twice as frequently among the psychoneurotic cases as among the surgical cases. To give the figures — among 114 cases of psychoneurosis studied, twenty-seven were of this "status type," an occurrence of 23.68 per cent., while among 119 surgical cases studied, only fifteen showed the syndrome — an occurrence of 12.60 per cent. It would seem figures unlike to that extent must carry some significance. And what are the inferences to be drawn?

The status lymphaticus syndrome is based on endocrinal disease, and since among war neurosis cases virtually twice as many individuals showed status lymphaticus as among other soldiers, our first conclusion is that an endocrinal abnormality, in some fashion, increases susceptibility to the neurosis.

A second conclusion growing out of the first quite naturally is that in considering the manner of development of a war neurosis physiologic factors need greater emphasis. Insufficiencies of a small or large degree which are surely physiologic in their background, whether working internally only or manifested as well by palpably bad behavioristic traits, cannot be ignored. They occur, and in the introspection which is offered by at least certain phases of the war game, they become all important. Such insufficiencies can be endocrinal. They are, in that instance, endocrinal, chemical and physiologic, and in the war neurosis have a rôle.

Finally, a different phase needs consideration. An hereditary psychopathic makeup is known to be associated with the status lymphaticus syndrome in a conspicuous degree. Emerson, in 1914, contrasted the occurrence of status lymphaticus among the patients in the alcoholic and drug addiction wards of Bellevue Hospital with its occurrence in the general wards. He found the incidence of status lymphaticus among the alcoholics was 22 per cent. — four times that in the general wards, and in another study he found that among dementia praecox cases the percentage is even higher. He says: "In the general medical wards of Bellevue Hospital . . . the incidence is less than a quarter of that found among alcoholics." Further, he concludes: "They (the status cases) cannot be expected to survive as well as normal men extreme fatigue, shocks, loss of blood, abuse

of narcotic drugs or surgical proceedings." Even more plainly established, however, is an association between status lymphaticus and hereditary tendencies of a psychopathic nature. This finding is applicable in the present study; for in figures concerning the large occurrence in the war neurosis of status lymphaticus — itself an earmark of psychopathic makeup — we have evidence that a psychopathic makeup is frequent in the war neurosis. It is confirmatory evidence of a conception that is not new and one that no one has expressed as well as Farrar, who writes: "It remains true that in the majority of severe war neurosis of all types there is evidence of a personal element of psychopathic potential."

SUMMARY

The incidence of so-called status lymphaticus in soldiers with psychoneuroses is virtually twice that in wounded soldiers who did not develop a neurosis. This finding appears to indicate that in the etiology of the war neurosis an endocrinal abnormality increases susceptibility to the neurosis. It emphasizes the fact that in many, if not in all cases, strong etiologic factors are at work in the physiologic domain without minimizing the importance of factors that are psychical. Rather, it brings new proof, of a physical character, of the conception that, in the war neurosis, an initial weakness operative in the psychical field, is essential.

The writer is deeply grateful to Major Edward Pershing, M. C., U. S. Army, and to Dr. George H. Kirby, formerly major in the U. S. Army, for permission to study the cases in their respective wards, and especially in debt to Dr. Kirby for numerous helpful suggestions.

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A STUDY OF HYSTERIA, BASED MAINLY ON CLINICAL MATERIAL OBSERVED IN THE U. S. ARMY HOSPITAL FOR WAR NEUROSES AT PLATTSBURG BARRACKS, N. Y.

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Etiologic Mechanism of Hysteria
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INTRODUCTORY REMARKS

It has been repeatedly observed that the apparent incidence of nervous and mental disorders in armies in times of peace is higher than in civil populations. The causes which combine to produce this general result are probably many and varied. To a certain extent, however, this statistical showing is to be ascribed not indeed to higher incidence, but to the fact that the exactions of military life bring to light constitutional weaknesses which, under other conditions, pass unobserved.

In times of war the apparent incidence is further and enormously increased, especially through the development of psychoneuroses; and thus the world war of 1914-1918 furnished experiences which brought into great relief certain neuropsychiatric problems.

War neuroses have their counterparts in peace times and in civilian life—particularly in the so-called traumatic neuroses and in hysteria. The war, however, created an unprecedented opportunity of observing such cases in large numbers and under conditions forcing into view their underlying psychic mechanisms.

The main object of this paper is to report in condensed and convenient form some of the material observed in the U. S. Army Hospital for War Neuroses at Plattsburg Barracks, N. Y., together with an analysis of it in the light, not only of my own experience, but also of published experience of others and of pre-war conceptions of psychoneuroses.

PURELY FUNCTIONAL AND MENTAL NATURE OF HYSTERIA

My experience has led but to a full confirmation of the long prevailing view of physicians that *hysteria is purely functional in its nature*. Hysterical manifestations not infrequently fasten themselves to a wound or a scar; often they are attributed by the patients to such physical factors as shell shock without wound, or to being buried in débris, becoming exhausted from continuous marching with heavy equipment, etc. An analysis of the cases, however, readily reveals the fact that *the mechanisms underlying hysterical symptoms are purely mental* and that the physical factors apparently involved operate not as such but through their psychic accompaniments, such as fright, disgust, rebellious feeling, suggestion, etc.

A striking instance of hysterical symptoms arising through suggestion originating in a trivial wound or scar is that in the case of B., Co. C., 23d Inf., who was admitted by transfer from Base Hospital No. 8, Savenay, France, on Oct. 15, 1918. He had a flat circular scar, about the size of a five-cent piece, on the outer side of the right leg. This scar marked the site of a superficial shrapnel wound sustained on the Verdun front on March 18, 1918. The fragment penetrated only the clothing and lodged in the soft tissues of the leg so superficially that another soldier was able to pry it out with the point of his penknife; iodin and bandage from a first-aid packet were applied and the patient sought no treatment by a medical officer. In about three weeks the wound healed completely. A few days later he developed "shell shock" with paralysis of both legs which eventually left a limping gait due to weakness of the right leg and an area of hypoesthesia most marked around the scar but in a lesser degree extending from the knee to within an inch of the ankle on the outer one-third of the circumference of the leg. Shortly after the armistice the patient recovered and on Dec. 12, 1918, he was returned to duty.

The view that the mechanisms underlying hysterical symptoms are purely mental is held almost unanimously by those of experience.

Möbius,[1] M. Lewandowsky[2] and Imboden[3] may be cited as random examples.

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1. Jelliffe, S. E.: Hysteria, in Modern Medicine, edited by Osler and McCrae, Philadelphia, P. Blakiston's Son & Co. **5**:655.

2. Lewandowsky, M.: Erfahrungen über Behandlung nervenverletzter und nervenkranker Soldaten, Deutsch. med. Wchnschr., Dec. 30, 1915.

3. Imboden, K.: Das Neurosenproblem im Lichte der Kriegsneurologie, Cor.-Bl. f. schweiz. Aerzte **47**:1098 (Aug. 25) 1917; abstr., J. A. M. A. **69**: 1305 (Oct. 13) 1917.

Although there is almost complete unanimity on the point of hysteria being a purely mental disorder, there is considerable divergence of views as to its exact nature and as to the mechanisms underlying its manifestations. Most of the current conceptions were formulated prior to the war. A brief restatement may be permitted.

Charcot's conception was that of a disease entity. This conception led to a preoccupation with symptomatology, differential diagnosis, clinical definition, and largely remained on a descriptive level.

Möbius saw in hysteria not a disease entity but a biologic trait characterized by a special type of reaction. "For him every one was more or less hysterical. Every one has hysterical small coin in the bank of his personality."[4]

Janet's contribution consists essentially in the theory of subconscious mental processes. An idea or a group of ideas may operate somewhere beneath the threshold of consciousness. For him "Hysteria is a form of mental depression, characterized by the retraction of the field of personal consciousness and by a tendency to the dissociation and the emancipation of systems of ideas and of functions which by their synthesis constitute the personality." [5]

Further progress in the analysis of hysterical mechanisms is due to Freud.[6] He attempts an explanation of the phenomenon of splitting or doubling of personality to which Janet has called attention. Ideas or complexes of ideas are lodged in the region of the subconscious not at random but by a purposeful functional process, which he terms *repression,* by reason of being charged with painful affect. The important part played by affect in the etiology of hysteria had, of course, long been sensed and had been insisted on in particular by Binswanger. Freud's experience has led him, moreover, to assume the universality of *a sexual origin* of the repressed complexes underlying hysterical manifestations.

The final principle of the Breuer-Freud hypothesis is the principle of *conversion.* The strangulated affect, the unreacted-to emotion, belonging to the disassociated state which has been repressed, finds its way into bodily innervation, thus producing the motor phenomena of hysteria. In this way the strong idea is weakened by being robbed of its affect—the real object of conversion.[7]

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4. Jelliffe, S. E.: Hysteria, p. 656.

5. Quoted by S. E. Jelliffe (Footnote 1).

6. Freud, S.: Selected Papers on Hysteria and Other Psychoneuroses, English translation by A. A. Brill, New York, Nerv. and Ment. Dis. Pub. Co.

7. White, W. A.: Current Conceptions of Hysteria, Interstate M. J. January, 1910.

There remains to be mentioned the contribution of Babinski,[8] which has largely dominated the French schools not only in pre-war years but even through the war, having apparently survived the light of the great mass of newly added experiences.

The essence of Babinski's contribution consists in an attempt to isolate from the heterogeneous mass of material traditionally thrown together under the heading of hysteria the elements of which it is composed. An application of more careful diagnostic technic has enabled him to eliminate organic cases, emotional disorders and reflex disorders, leaving behind a more restricted hysteria to which he has applied the newly-coined term *pithiatism*. For him *hysteria, in this restricted sense, consists in manifestations which are brought into existence by the influence of suggestion and the cure of which takes place by persuasion.*

Perhaps the most significant point insisted on by Babinski is the necessity for distinguishing true hysteria from simulation, especially where the latter manifests itself in characteristically hysterical phenomena—paralyses, contractures, anesthesia, etc. The result of treatment by persuasion here becomes the basis of the differentiation: If persuasion fails to cure, the case is not hysteria but simulation.

The question may properly be raised, *How do the facts, which have been observed in the course of our experience, square with current pre-war theories?*

A study of the Plattsburg material seems to indicate the following:

1. Hysterical phenomena are a special group of manifestations arising on a basis of neuropathic constitution.

2. Neuropathic heredity is probably the essential factor in the etiology.

3. The frequent occurrence of dissimilar heredity and, in the patients themselves, of neuropathic traits not specifically hysterical, points to a relationship of some sort between hysteria and other manifestations of neuropathic constitution.

4. The hysterical tendency varies widely in degree and shades off toward normal constitution by gradual transition. Thus, in some cases the tendency becomes manifest in childhood and continues to be so through life under ordinary conditions, while in other cases it remains latent until brought to light by some extraordinary condition on removal of which it lapses again into latency.

In other words, this material leads away from Charcot's conception of hysteria as a disease entity and rather toward that of Möbius,

8. Babinski: Démembrement de l'hystérie traditionnelle. Pithiatisme, Semaine méd., Jan. 6, 1909; Babinski and Froment: Hystérie, pithiatisme et troubles reflexes, Collection Horizon, Paris, 1916.

which regards clinical hysteria merely as exaggerated manifestation of a common biologic trait. These views are based mainly on data which have been summarized in Tables 1-6.

ANALYSIS OF TWO SELECTED GROUPS OF CASES OF HYSTERIA

These data arise from two selected groups of cases of hysteria. Group 1 consists of fifty patients in whom hysteria existed prior to enlistment and was not incurred in line of duty; patients disposed of by discharge on certificate of disability. Group 2 consists of fifty patients in whom no evidence of the existence of hysterical manifestations prior to enlistment could be obtained; in these patients the condition was, therefore, considered in line of duty; all of them eventually recovered and returned to duty. Naturally, the more pronounced cases are those of Group 1.

Table 1 shows neuropathic heredity in a high percentage of cases in both groups, but in a higher percentage in Group 1 than in Group 2.

TABLE 1.—NEUROPATHIC HEREDITY

	Group 1, per Cent.	Group 2, per Cent.
Family history positive for neuropathic heredity	76	52
Family history negative for neuropathic heredity	24	46
Family history unascertained	—	2

Table 2 shows in detail the various neuropathic conditions recorded in the family histories of hysteria patients. It demonstrates the fact of dissimilar heredity and the greater prevalence of the various neuropathic conditions represented therein in the families of patients in Group 1 than in those of Group 2.

TABLE 2.—NEUROPATHIC CONDITIONS IN FAMILY HISTORIES OF HYSTERIA PATIENTS

	Number of Cases	
	Group 1	Group 2
Epilepsy	14	5
Fainting spells	11	2
Sick headaches	8	6
Insanity	10	6
Feeblemindedness	—	1
Alcoholism	7	10
Criminalism, eccentricities, temperamental anomalies	15	6
Other nervous diseases (nervousness, breakdown, etc.)	42	36
Total	107	72

Table 3 shows social maladjustments prior to enlistment. These consist in poor progress in school, poor showing in work (frequent aimless changes of occupation, low earnings, long periods of idleness,

etc.), intemperance, criminalism, domestic maladjustments, etc. The table shows that the percentage of social maladjustment is much higher in Group 1 than in Group 2.

TABLE 3.—Social Maladjustments Prior to Enlistment

	Group 1, per Cent.	Group 2, per Cent.
History positive as to social maladjustment	62	40
History negative as to social maladjustment	38	56
History unascertained	—	4

Table 4 shows in detail the various items of social maladjustment, giving, for the two groups respectively, the number of instances of each item. There are more items of maladjustment than cases of maladjustment, in both groups, as in many cases there is a record of more than one item. But it should be noted that the excess of items of maladjustment in Group 1 as compared with Group 2 is out of proportion to the excess of cases of maladjustment. We find, indeed, that while cases of maladjustment in Group 1 as compared with Group 2 are in the proportion of 155 : 100, items of maladjustment are as 227 : 100.

A further analysis of the data shows that 86 per cent. of the cases in Group 1 and 68 per cent. of those in Group 2 present either neuropathic heredity, or a history of social maladjustment, or both.

In other words, the data indicate that Group 1 is characterized not only by a greater percentage of cases of defective constitutional make-up, but also that the defectiveness is of a graver sort in the average cases in that group: it becomes manifest at an earlier age and is more persistent and more general.

TABLE 4.—Items of Social Maladjustment

	Number of Instances	
	Group 1	Group 2
Poor progress in school	24	9
Poor showing in work	13	2
Intemperance	8	9
Criminalism	4	2
Other maladjustments (domestic, etc.)	10	4
Totals	59	26

Thus I find in these data an explanation for their maladjustment to the military régimen and for variation in degree of such maladjustment. Turning now to the military record of these soldiers I find that the data afford a rough measure of such maladjustment, i. e., something more than a mere impression.

It will be seen from Table 5 that the great majority of the men in Group 1 did not enlist voluntarily but were drafted, while the opposite is true of the men in Group 2; also that a greater number of the men in Group 1 are known to have claimed exemption from the draft. It will be understood, of course, that in none of the cases had any claim for exemption been found valid by the draft boards.

TABLE 5.—Manner of Entrance Into Military Service

	Group 1	Group 2
Enlisted voluntarily	11	32
Drafted	39	17
Unascertained	—	1
Claimed exemption from draft	5	2
Did not claim exemption	19	37
Unascertained	26	11

The principal manifestation of hysteria is invalidism of one sort or another without organic basis. However, all the cases in the two groups under consideration were ambulant cases. Though presenting, perhaps, a limping gait, a tic, a tremor, a contracture, a paralyzed arm, aphonia, a stooped-over position, or, on occasion, fainting spells or even violent convulsions, the symptoms were disabling only as regards drilling, hiking or duty of any kind, but not as regards taking a leisurely constitutional, attending an entertainment, visiting lady friends in town, being absent without leave or eating three meals a day.

In the light of these considerations, the amount of time spent in a hospital by an hysterical patient acquires a special significance as throwing a side light on the degree of constitutional defect present in a given case.

In Table 6 the cases of both groups have been divided according to the fraction of time spent in hospitals since entering the army. It will be seen that the men in both groups spent a strikingly large part of the time in hospitals, but that those in Group 1 did so to a far greater extent than those in Group 2. The majority of the men in Group 1 rendered little or no service in the emergency, proving themselves instead but an added burden and expense to the government.

TABLE 6.—Fraction of Time Spent in Hospitals Since Entering Military Service

	Number of Cases	
	Group 1	Group 2
Less than two-fifths	9	25
From two-fifths to three-fifths	16	13
From three-fifths to four-fifths	13	8
Over four-fifths	12	3
Unascertained	—	1

The data exhibited in Tables 5 and 6 afford some hint as to the motives which actuate hysterical conduct; a discussion of these motives follows later.

As further evidence of the constitutional defect underlying hysteria may be mentioned its very frequent association with other constitutional disorders, such as constitutional psychopathic states, epilepsy, alcoholism, and especially mental deficiency. As regards the latter condition alone, our psychologic department reported the results of intelligence tests as indicating that no less than 31 per cent. of the patients with hysteria were under 10 years in mental age.

ETIOLOGIC MECHANISM OF HYSTERIA

The constitutional basis of hysteria being granted, the question still remains, What are the immediate factors at work in the etiologic mechanism; or, more specifically, In what way are disabling manifestations produced and maintained?

The patients themselves, especially the more feebleminded and ignorant among them, are apt to attribute their disabilities to trivial and inadequate causes. Good examples are:

> Tonsillectomy producing aphonia; malaria producing aphonia; a cold producing aphonia; measles producing aphonia; herniotomy producing a limping gait; astasia-abasia caused by a 2-mile hike; "shell-shock" producing paralysis of both legs; stooped-over position, so-called camptocormia, produced by a slight blow on the groin and later aggravated by an operation for varicocele; typhoid and paratyphoid protective inoculation causing hemiplegia and hemianesthesia; sudden monoplegia with anesthesia affecting one arm, produced by "a stroke" without known cause; violent convulsions produced by attempt to obtain blood for Wassermann reaction test from vein in arm.

It is obvious that these alleged causes hardly deserve consideration; they are, at most, occasions out of which have arisen suggestions in part determining the particular symptomatology, rather than true causes. The causes assigned by medical officers are, as a rule, of a different order. In the early months of the war physical and psychic factors were mentioned more or less indiscriminately:

> Cases of nervous and mental shock were found to be due sometimes to the bursting of heavy shell near the man, to his burial under earth and débris, or to the effects of noxious gases; in other cases to nervous exhaustion due to sleeplessness, fear, anxiety or other prolonged strain.[9]
>
> The symptoms are always referable to the strain of active service. Sniping is important, the ghastly sights of carnage are still more responsible, but the intensest strain is high explosive shell fire.[10]

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9. Turner, W. A.: Cases of Nervous and Mental Shock Observed in the Base Hospitals in France, Brit. M. J., May 15, 1915.

10. Forsyth, D.: Functional Nerve Disease and the Shock of Battle, Lancet, Dec. 25, 1915.

Campbell names three etiologic factors in these neuroses—the noise of the exploding shells, the violent atmospheric concussion, and the fear caused by the terrifying war conditions.[11]

Myers divides mutism into two groups according to causes—physical and psychic. His impression is that the two groups occur with equal frequency.[12]

Gradually, as the distinction became clear between true cerebral concussion and psychoneuroses, the view gained ground that physical factors, as such, played no part in the etiology of psychoneuroses.

Bonhöffer noted that many symptoms of war neuroses were such as fright itself may directly induce. Karplus found that while physical traumata were often present, they were also at times absent.[13]

The explosion has not only physical effects, but also a psychic one, which consists in an emotional shock. In certain cases this *emotional shock* dominates the situation to the point of being alone responsible for the neuro-psychic symptoms which a hasty and superficial consideration at first placed in relation to cerebral concussion; and it is because both give rise to an emotional shock that the explosion of a shell and a terrifying sight find expression in the same syndrome.[14]

ACUTE EMOTIONAL DISORDERS TO BE DISTINGUISHED FROM HYSTERIA

In studying the etiology of war neuroses it would seem important to distinguish the acute emotional disorders observed at the front from hysteria. This distinction has been, perhaps, most clearly drawn by Léri who had opportunities of seeing cases at the front, in field hospitals and in neuropsychiatric centers in the interior. According to this author, it is a mistake to think that hysterical manifestations are an integral and necessary part of the emotional syndrome. They can appear independently of all emotion; and the emotional syndrome has nothing in common with hysteria.

It seems that the psychic factors to which war neuroses in general are attributed—fright caused by danger from projectiles, horrifying sights, etc.—play a part only in the acute emotional syndrome; hysterical phenomena are not directly produced by them. On this point there is unanimous agreement among those who have had opportunities of observing cases at the front.

It is a remarkable fact that hysterical manifestations never appear except when a patient is in a place of security: in a trench, a dugout, a first-aid sta-

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11. Campbell, H.: War Neuroses, Practitioner, London, May, 1916.

12. Myers, C. S.: Contributions to the Study of Shell Shock (IV), Lancet, Sept. 9, 1916.

13. Birnbaum, K.: Kriegsneurosen und -psychosen auf Grund der gegenwärtigen Kriegsbeobachtungen; erste Zusammenstellung vom Kriegsbeginn bis Mitte März, 1915, Ztschr. f. d. gesamte Neurologie u. Psychiatrie, 1915; reviewed by August Hoch in New York State Hosp. Bull. **8**:287, 1915.

14. Rogues de Fursac, J.: Traumatic and Emotional Psychoses; So-Called Shell Shock, Transl. by A. J. Rosanoff, Am. J. Insan. **75**:19 (July) 1918.

tion. Moreover, they disappear, as by magic, either when security is diminished, as by the dugout being shelled, or when the ambulance is in sight for the evacuation of the wounded. Often they appear during the period of artillery action in preparation for an attack; but never has an hysterical convulsion or paralysis been seen in the open, on the battlefield, under exposure to a barrage—a fact which seems to us of major interest for the understanding of the pathogenesis of hysterical disorders.[15]

Psychoneurotic affections need not follow directly on the causative emotional disturbance, but an incubation period of varying length may intervene. In the firing line psychoneuroses are rare. But once he is out of danger, the psychopath, no longer dominated by instinct, is a prey to any abnormal mental and neurotic states that conditions or events, present or previous, may arouse in him. These manifest themselves in contractures, paralyses, tremors, convulsive fits, etc.[16]

Those disorders which develop at the front and are the direct expression of violent emotion are never of long duration; they last scarcely more than a day or two; the intensity of their manifestations subsides rapidly and almost all patients can be returned to the front within a few days. Many, it is true, have to be kept in the field hospital as long as a week or ten days, but this is generally due not to persistence of the emotional disorder proper, but to the physical exhaustion from overexposure, overexertion, lack of sleep, lack of food, etc., which usually accompanies it.

Capt. William Brown reports that of 200 nervous and mental cases which passed through his hands in December, 1916, 34 per cent. were evacuated to the base after seven days' treatment, and 66 per cent. returned to duty on the firing line after the same average period of treatment.[17]

The immense majority of cases of emotional disorder return to the front, cured, without ever reaching the zone of the interior.[18]

The recovery in cases of uncomplicated emotional disorder is usually complete. Of course a tendency toward recurrency remains. In some cases it can be demonstrated, according to some observers, that a heightened emotional susceptibility has been produced.

To becoming accustomed to emotions, which fortunately is the rule, there is opposed a certain "anaphylaxis" toward emotions; but in the genesis of such anaphylaxis, it should be stated, one is obliged to go back to a certain degree of predisposition which is more or less constitutional.[19]

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15. Léri, A.: Commotions et émotions de Guerre, Paris, 1918; reviewed by A. J. Rosanoff in Arch. Neurol. & Psychiat. **1**:273 (Jan.) 1919.

16. Molinari, G.: Nosografia delle psiconeurosi di guerra, Riforma med., Naples **33**:898 (Sept. 15) 1917.

17. Salmon, T. W.: The Care and Treatment of Mental Diseases and War Neuroses ("Shell Shock") in the British Army, New York, The National Committee for Mental Hygiene, 1917.

18. Léri, A.: Commotions et émotions de Guerre, Paris, 1819; reviewed in Arch. Neurol. & Psychiat. **1**:273 (Jan.) 1919.

19. Léri, A.: Commotions et Emotions de Guerre, Paris, 1918.

The psychoneurotic symptoms which persist and which force the evacuation of cases to the rear (save possibly those seen in the rare cases of "emotional anaphylaxis"), and more particularly hysterical symptoms, are, thus, evidently to be regarded not as direct products of emotional shock but as arising, after the lapse of a greater or lesser interval of time, by a different psychic mechanism.

ILLICIT MOTIVE AS FACTOR IN ETIOLOGY

I come now to the consideration of a factor which, though seldom frankly avowed by patients and seldom definitely established by clinical investigation in individual cases of hysteria, yet has made itself clearly apparent to many observers in all armies. Speaking for myself and with special reference to my experience in this hospital, I would say that this factor has obtruded itself on my attention until I have come to regard it as the mainspring of hysterical conduct.

This factor consists in a *concealed, illicit, morally untenable motive.*

The motive is not always the same, but it is always characterized by the above mentioned qualities. Its most frequent variations are:

1. To evade the law of conscription.
2. To procure, on reporting for physical examination at a training camp, rejection for physical unfitness.
3. To evade dangerous, disagreeable or difficult duty, or to evade all duty.
4. To procure the ease and privileges of hospital care.
5. To procure discharge on certificate of disability.
6. To procure compensation for disability.

As stated above, not I alone, but also other observers, in all armies, have been impressed with this factor in the mental mechanism of hysteria and have more or less clearly formulated their impression.

> The psychological basis of the war neuroses (like that of the neuroses in civil life) is an elaboration, with endless variations, of one central theme: escape from an intolerable situation in real life to one made tolerable by the neurosis.[20]
>
> As long as war is in progress and return to the front is imminent the patient prefers (unconsciously at least) to retain his disability rather than to face the perils and discomforts of trench life.[21]
>
> Speaking in particular of refractory hysterical phenomena, Léri says: "In all cases they originate not in emotion, but in reflection, when emotion no longer exists; they originate in the idea of retirement on pension with its double benefit of further removal from danger and pecuniary indemnity."[22]

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20. Salmon, T. W.: The Care and Treatment of Mental Diseases and War Neuroses ("Shell Shock") in the British Army, New York, The National Committee for Mental Hygiene, 1917.

21. MacCurdy, J. T.: War Neuroses, Psychiat. Bull., July, 1917.

22. Léri, A.: Commotions et émotions de Guerre, Paris, 1918.

The "wish" is certainly a strong etiologic factor in these functional conditions. This is shown by the fact that, with injuries which *a priori* render a soldier unfit for further active service, they are very rarely found.[23]

The motivation of psychogenic neuroses consists of a subconscious wish to escape the events which produced them—a "recourse to neurosis," at least in so far as the picture is dominated by hysteria and whenever there has been an internal conflict. In fright neuroses there is no such motivation.[24]

Henneberg does not expect much from psychotherapy for soldiers who have been at the front. The men have no wish to recover and be sent back.[25]

In the individual case direct evidence of illicit motive is seldom available. This, however, is in the nature of things and is not surprising. Yet not infrequently patients make unguarded remarks which amount almost to a confession. These are some examples:

1. A soldier was asked, How old were you when you were drafted? "I was within ten days of being 32 years of age. They beat me to it by ten days." (H., Hqs. Co., Classification Camp, A. E. F., France.)

2. Q. If you were as much disabled when you were drafted as you are now, why did you not claim exemption? A. "It was no use. Our local board took in everybody regardless. You'd have to be dead to get exemption." (P., 51 Co., 159 Depot Brigade, Camp Taylor, Ky.)

3. A soldier had a violent hysterical convulsion on the veranda in front of the window of the office of the senior member of the disability board. After about twenty minutes of violent commotion, he arose and came, weeping, into the office: "Oh, Major, did you see me have that spell?" Yes, I did. "Oh, Major, don't give me an S. C. D." (Surgeon's certificate of disability for discharge). I am afraid I shall have to. "Very well, sir, it's up to you; you are the head of the board." (F., 2 Tank Co., A. E. F., France.)

4. One soldier simply declared, "I am a case of constitutional inferiority; a good many doctors said that; the local board had no business to draft me into the army; it is the duty of the medical officers to rectify the mistake; it is their duty to discharge me." (M., 50 Co., 159 Depot Brigade, Camp Taylor, Ky.)

The avowed intention was almost always to serve the country and even die for it; but "Captain ——— in Base Hospital —— — told me I was not fit for the army. If I am not fit for duty, then why don't you give me my discharge?" This argument, in one form or another, was very common among those whose motive it was to secure discharge on certificate of disability.

That illicit motive, and it alone, and not shell concussion, war strain, emotional shock, etc., is the factor which actuates hysterical conduct is further shown by three groups of observations.

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23. Lewandowsky, M.: Erfahrungen über Behandlung nervenverletzer und nervenkranker Soldaten, Deutsch. med. Wchnschr., Dec. 30, 1915.

24. Saaler, B.: Ueber nervöse und psychische Krankheiten in ihren Beziehungen zum Kriegsdienst, Berl. klin. Wchnschr., Dec. 25, 1916.

25. Zeehandelaar, I.: Nederl. Tijdschr. v. Geneesk. **2**:41 (July 1) 1916; abstr., J. A. M. A. **67**:890 (Sept. 16) 1916.

In the first place are to be mentioned the cases of hysteria arising in training camps in this country. In every National Army cantonment many cases came to light often on the day of reporting for military duty, more often early in the course of training—at any rate before any "war strain" could possibly have made itself felt. These cases presented all the manifestations of hysteria which, when seen in overseas cases, have so often been attributed to "shell shock."

In the second place is the striking fact that among prisoners of war who have been, like other soldiers, exposed to shell fire, strain, etc., scarcely any cases of hysteria or other psychoneuroses have been observed.

Mörchen found only five cases of war neuroses among the 40,000 war prisoners at the Darmstadt prisoners' camp. There is every reason to assume that they had been subjected to the same kind of mechanical and emotional stress as the German soldiers, among whom hysteric nervous disturbances were so common. Lust,[26] reviewing 20,000 war prisoners, found the war neuroses rare among both military and civilian persons.

Victims of war neuroses usually are not taken from among the wounded, contrary to Oppenheim's statement. They seldom occur among prisoners even when they have been shocked severely. Prisoners are actuated by one great desire; to remain well so that when they are exchanged they may return home in good health.[27]

In the third place is the very common experience of quick and complete recovery from hysterical symptoms on evacuation to a base hospital, followed by a return of the symptoms in the same or even a greater degree of intensity or by development of new symptoms on any prospect arising of again being sent to duty. Many of the overseas patients have furnished such a history. The relapse has generally occurred either on the way from the hospital to a reclassification camp or shortly after arrival there. Sometimes no cause is given for the relapse; at other times a trivial cause.

1. "The very day I came to the replacement camp from the nerve hospital, I was made so nervous by the men shouting and knocking their mess kits against the wall that I could not speak my name and shook all over." (B., Co. C, 23 Inf.)

2. "I was sent from Base Hospital No. 34 to the replacement camp and on the following day assigned to duty. That evening as I stood on a barrel looking in through the window at a Y. M. C. A. entertainment, a gasoline engine a short distance away made a sharp noise. This frightened me greatly; I began to shake violently and got off the barrel on which I was standing." He was ordered to remain in quarters by a medical officer; the following day he was no better and remained in bed; on the day after, still being no better,

26. Lust, F.: Kriegsneurosen und -gefangene, München. med. Wchnschr. **63**:1829 (Dec. 26) 1916; abstr., J. A. M. A. **68**:667 (Feb. 24) 1917.

27. Gaupp, R.: J. A. M. A. **68**:647 (Feb. 24) 1917.

he had to be readmitted in Camp Hospital No. 26. After two weeks in the hospital his nervousness continued and he was transferred to Base Hospital No. 8, thence to be returned to the United States (M., Co. C, 28 Inf.).

Others have recorded similar observations.

Severe types that exhibit well-marked symptoms after six months do not recover in the army. A considerable proportion of those who "recover" in hospital break down again at their depots or command depots.[28]

In the case of very slight affections, to the casual observer the patients seemed well and ready for action. But the whole state of affairs was altered as soon as the physician suggested that they begin active service again. Reassuring suggestions, that had hitherto been very effective, were no longer of any avail. The patient leaves the hospital at once; at the railroad station acute symptoms appear; and, on arriving at his regiment, nothing remains to be done but return him to the hospital. In some patients, the acute symptoms reappear even before they start to rejoin their regiments. In all such cases, there seems to be the one predominating etiologic factor—fear and horror at the thought of returning to the front.[29]

The extremely logical and extremely brutal method introduced by Kaufmann, consisting in strong electric shocks with loud staccato military commands to do certain exercises, has realized some surprising cures, but time has shown that relapses are liable to follow on the slightest provocation.[30]

If it is true, as stated above, that the essential element of etiology in hysteria, aside from inborn predisposition, is the existence of a concealed, illicit, morally untenable motive, it is not difficult to explain why the war has produced so many cases: It created situations in which men's natures have suddenly come to be subjected to the acid test of demand for greater personal sacrifice. It was inevitable that natures deficient in physical stamina, courage and moral inspiration should become actuated by ignoble motives.

Although it has been said that special conditions of modern warfare are responsible for the great number of psychoneuroses and that in previous wars no such effects had been observed, the fact is that, under other names, in various forms, invalidism without organic basis undoubtedly existed in abundance in all wars.

It was early discovered that when men left the field for medical treatment, they were lost for the campaign, if not for the war. The aggregate absent from the two armies (on the Potomac and in Washington), which should have been united at Antietam, was 101,756. The total in action was but 87,164. Many of those absent by authority are those who have got off either sick or wounded, or under pretense of sickness or wounds, and having origi-

28. Ballard, E. F.: Some Notes on Battle Psychoneuroses, J. Ment. Sc., July, 1917.

29. Gaupp, R.: Hysterie und Kriegsdienst, München med. Wchnschr., March 16, 1915.

30. Imboden, K.: Das Neurosenproblem im Lichte der Kriegsneurologie, Cor.-Bl. f. schweiz. Aerzte **47**:1098 (Aug. 25) 1917; abstr. J. A. M. A. **69**: 1305 (Oct. 13) 1917.

nally pretext of authority are still reported absent by authority. (From General McClellan's letter to the President under date of July 15, 1862): "The reduced condition of the old regiments . . . points to the necessity of earnest endeavor to collect all the absent officers and men belonging to these organizations. I suggest that every hospital . . . be inspected within the month of October by, if necessary, scores of officers detailed for the purpose, to ferret out the old soldiers hidden away therein. Such an inspection would produce more fruit in one week than the recruiting service can in three months. And finally, I would suggest to the War Department . . . the arrest of deserters. Convalescent soldiers leave hospitals, and have done so for the past year, and return home habitually. It is the experience of every army commander that not more than a tenth of the soldiers who are left behind sick ever rejoin." (From General McClellan's letter to the President under date of Sept. 28, 1862): "Malingerers soon become adepts in feigning all manner of diseases. By June, 1862, impositions became so frequent, that discharges for rheumatism had to be prohibited in orders. Any soldier who had once returned to his village, or his home, could at any moment procure his discharge, provided a physician "in good standing" would honestly or corruptly sign a certificate. The number of men discharged in 1862, by means of the combined agencies referred to, approximated 100,000 men. The immediate effect of those discharges was to reduce all the regiments in the field to mere skeletons; their permanent effect can be seen today in the system of pensions. The total amount paid in 1903 for pensions and the expense of maintenance during the fiscal year was $141,752,870.50.[31]

The above abridged quotations, all of which pertain to the Union Army in the Civil War, show that what we now call war neuroses were not only present then but that they constituted an evil of even greater magnitude, relatively, than in the world war of 1914-1918.

PSYCHIC MECHANISMS UNDERLYING CURES

The point of view advanced here with reference to the mechanism of hysteria is borne out not only by the conditions under which the disabling symptoms arise, but also by the conditions under which they disappear.

The factors to which patients themselves attribute their cures are apt to be, like the causes they assign for their troubles, trivial and inadequate. The following are typical examples:

1. "I was cured by a miracle of the Lord." (D., 72d Co., 159 Depot Brigade, Camp Taylor, Ky. Case of hemiplegia and hemianesthesia.)

2. "Captain N. lifted up a little bone in my ear that had got out of place and from that moment I could hear as good as ever." (S., Hqs. Co. 39 Inf. Deafness was complete and bilateral; manipulation was limited to left ear.)

3. "Captain K. gave me electrical treatment, and after the second treatment I was all cured up." (N., Co. E, 155 Inf. Labored gait due to contractures at both knees in position of partial flexion.)

4. "Captain H. cured me in less than five minutes with hypnotism." (T., Co. I, 372 Inf. Case of tremor of head, trunk and upper and lower extremities,

31. Upton, Emory: The Military Policy of the United States, Ed. 4, Washington, D. C., 1917.

grotesque gait, high-pitched voice, explosive utterance, tendency to repeat each word or phrase in conversation three or four times rapidly.)

5. "I ate at first one half of an apple; on offering the other half to a patient friend, he refusing it, I said right out, surprising myself, 'I will eat it myself.' I think the apple and the massage did it; therefore I will eat apples forever, they being my lucky fruit." (W., Co. D, 310 Lab. Bn. Case of aphonia.)

6. "In the hospital in France I lay helpless in bed, unable to move or even sit up. The ward surgeon said I might never be able to get up and walk again. Then I prayed the most earnest prayer I ever prayed in my life. On the following day I got out of bed, just tumbled out; from then on grew gradually better; at first was able to crawl around on the floor, then walk about on crutches. Started for the United States on July 1. On board ship used two canes in walking instead of crutches. At the Embarkation Hospital in Newport News, Va., I no longer used crutches or canes and have used none since." (S., T-7, 23 Eng.)

Turning now to the attitude of medical officers regarding cures of hysterical manifestations, I find a striking general tendency to ignore mental mechanisms underlying pathogenesis and course. Only external aspects of hysteria as a rule receive consideration. The preoccupation seems to be with description of manifestations, charting of areas of anesthesia, differentiation from various organic affections, etc. The first object is generally diagnosis; when that is established no further investigation of mental mechanism is attempted. The next step is treatment—again without reference to the mental situation; and cures are attributed to this or that therapeutic method, every method having its advocates and opponents:

Work and interest in extraneous life are the best cure for such cases.[32] In the way of treatment complete physical and mental rest are essential for both neurasthenia and shell shock.[33]

Massage and electricity should be avoided in hysterical cases.[34] That this (faradic current) is an indirect method of suggestion no one can deny; but the important point is that the procedure is efficacious, uniformly efficacious, quickly efficacious. It need only be tried to demonstrate its almost infallible action.[35]

The results of this treatment (chloroform anesthesia combined with suggestion) have been so satisfactory that I desire to give some account of the details of the same in this brief note.[36] The author disapproves of the use of an anesthetic for curing deaf-mutism.[37]

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32. Turner, W. A.: Cases of Nervous and Mental Shock Observed in the Base Hospitals in France, Brit. M. J., May 15, 1915.

33. Hurst, A. F.: Functional Nervous Disorders, Medical Diseases of the War, London and New York, Longmans, Greene & Co., 1917.

34. Campbell, H.: War Neuroses, Practitioner **96**:501 (May) 1916.

35. Chavigny, P.: Psychiatrie aux armées; therapeutique et médecine légale, Paris méd., Jan. 1, 1916.

36. Milligan, E. T. C.: Method of Treatment of Shell Shock, Brit. M. J. **2**:73 (July 15) 1916.

37. Russell, C. K.: Study of Certain Psychogenetic Conditions among Soldiers, Canad. M. A. J., August, 1917.

The treatment par excellence is hypnotic suggestion.[38] Nonne calls attention to the advantages of hypnotic suggestion. Cures are frequent and rapid.[39] As to hypnotism, no more need be said than that its use is prohibited in military hospitals.[40] Psychic treatment without hypnosis is recommended.[41] It is striking to note how frequently hypnosis is condemned as inadequate or actually deleterious.[42]

If further treatment is required, psycho-analysis is necessary, and the problem now becomes an everyday neurosis, the incidents of the war merely being the most recent in a life-time of mental strains.[43] However helpful psycho-analysis may be in time of peace, in time of war such methods appear unnecessary and undesirable.[44]

PARTICULAR METHOD OF THERAPY OF COMPARATIVELY LITTLE IMPORTANCE

I am able to report from my own experience that the particular method of therapy employed is a matter of comparatively little importance. The mechanism of cure readily reveals itself when studied in the light of the above discussed mechanism of etiology. One or more of the following factors are frequently seen to be operative in cures:

1. An attitude on the part of medical officers impressing patients in such a way as to preclude any hope of successful imposition.
2. Demonstration of the unreal nature of the disability.
3. Strict discipline as opposed to sympathy, doddling or humoring.
4. Painful or otherwise disagreeable features of treatment.
5. Removal of motive actuating the symptoms by change in situation.

These factors deserve somewhat detailed discussion. The first mentioned factor is all important for the prevention of hysterical manifestations and for their suppression in the earliest stages. The frequency of hysterical manifestations arising at the front has been observed to vary extremely according to the local atmosphere created by medical officers.

For instance, in the army in which we had the direction of the neurological center, we have had the satisfaction of seeing the number of "nervous seizures"

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38. Eder, M. D.: War Shock; the Psychoneuroses in War; Psychology and Treatment, Philadelphia, P. Blakiston's Son & Co., 1917.

39. Berlin Letter, J. A. M. A. **66**:440 (Feb. 5) 1916.

40. Chavigny, P.: Psychiatrie aux armées; therapeutique et médecine légale, Paris méd., Jan. 1, 1916.

41. Babinoff, Y. K.: Injuries to the Nervous System Caused by the War, Russk. Vrach, Petrograd, 1915.

42. Functional Psychic Disturbances in the Light of the War, editorial, Med. Rec., Aug. 26, 1916.

43. Forsyth, D.: Functional Nerve Disease and the Shock of Battle, Lancet, Dec. 25, 1915.

44. War and Psychoanalysis, editorial, New York M. J., Dec. 23, 1916.

diminish from the time the rumor was spread—through soldiers who had returned to their organizations without permission—that with us "the seizures were not in good repute and were regarded rather with disfavor." As to mutisms and deaf-mutisms, we have seen them arise in certain armies in the form of veritable little epidemics, whereas in others they were almost unknown.[45]

As to the second factor—demonstration of the unreal nature of the disability—it is plainly operative in the cures of aphonia and mutism by means of general anesthesia and by the "ball method," and in the cures of paralyses, especially of the lower extremeties, by means of strong electrical stimulation. Patients dread being detected in the act of simulation and therefore yield to the "treatment" rather than allow it to appear too clearly that they are able to phonate, talk or move their limbs, and yet will not do so. Under the circumstances, to fall in with the purpose of the doctors and declare themselves cured becomes for the patients the best way out of an extremely awkward and even dangerous situation.

The administration of ether for the cure of functional deafness and functional loss of voice has always in our hands proved satisfactory. It is essential that the loss of consciousness be slight, and that the patient be suddenly roused so as to realize that he is speaking or hearing.[46]

A number of interesting case histories are cited to show the use of the "ball method" for curing aphonia. This method consists in introducing a ball into the larynx to cause temporary suffocation and thus produce a reflex restoring functioning power to the adductors. The method should be applied as soon as the patient has recuperated from the shock that caused the aphonia. Usually one short sitting only is necessary. The author feels that some cases of this kind are led to prolong their trouble by the desire to get as much war indemnity as possible.[47]

The principle involved in the cures of paralyses and anesthesias by electricity likewise consists in surprising or forcing the patient into betraying by an involuntary movement the functional integrity of both motion and sensation in the affected limb.

The third factor—strict discipline—is unanimously insisted on by all who have had cases of war hysteria to treat, although they have so widely disagreed on other points. This factor is related to the first and supplements it by impressing on patients not only the hopelessness of imposing deception on medical officers, but also the certainty of every attempt to derive advantage from being "sick" being promptly met by measures of discipline.

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45. Léri, A.: Commotions et émotions de Guerre, Paris, 1918.

46. Bruce, A. N.: The Treatment of Functional Blindness and Functional Loss of Voice, Rev. of Neurol. & Psychiat., May, 1916.

47. Muck, O.: Weitere Heilungen von Stimmverlust im Kriege, München. med. Wchnschr. **63**:1466 (Oct. 10) 1916.

The fourth factor—painful or otherwise disagreeable features of treatment—very often succeeds where other methods have failed. It would seem hardly necessary to go into discussion of the mental mechanism of this factor; obviously it works by directly combating the motive by which the symptoms are produced — that of securing relief from dangers and hardships—and by substituting a new motive and a more immediately urgent one—that of getting "cured" and thereby escaping the painful treatment.

F. Kaufmann[48] is the accredited author of a system of treatment which even some of his fellow countrymen have considered inhuman. . . . Kaufmann worked out a system of combined suggestion and painful electrical shock, aiming at a drastic cure in one sitting. The germ of this principle dated from 1903, when, as an assistant to Erb, he observed the beneficial effects of remorseless electrical treatment in a case of hysterical muscular contraction. His system includes the four following principal features:

1. Preliminary suggestion, consisting not only of the stock methods of suggestion, but also the "atmosphere" of a hospital in which successful cures are numerous.

2. Powerful electrical shocks supplemented by vigorous "word suggestion." As a rule, the sinusoidal current of a pantostat was preferred to the faradic current. It was combined with the galvanic current when there were symptoms of hysterical anesthesia. Some idea of the patients' sensations may be gathered from the term *Ueberrumpelung* (unexpected attack) used in the author's description.

3. Maintenance of an atmosphere of strict military discipline.

4. Masterfulness and pertinacity were essential; it might take hours before the desired effect was obtained, but with perseverance and the exertion of the physician's whole personality success was ultimately achieved. . . . After the ordeal the patient should be kept in hospital a few weeks to diminish chances of relapse.

Prof. Otto Schultze[49] admits that this system has been stigmatized as inhuman, but does not, he thinks, inflict pain very different from that of a woman in labor. At his hospital he found Kaufmann's system vastly superior to others.[50]

Similar success has been attained in the treatment of refractory cases of hysteria by some neurologists in France by a method of painful electric shock, so-called *"méthode du torpillage"* (Vincent, Rimbaud, Trenel).

Myers found that in many cases these sensory disorders clear up spontaneously. Sometimes he saw marked improvement during an examination (a hypalgesia and hypesthesia completely disappeared after several *deep* pricks which the patient felt).[51]

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48. Kaufmann, F.: München. med. Wchnschr., May 30, 1916.

49. Schultze, O.: Münch. med. Wchnschr., **63**:1349 (Sept. 19) 1916.

50. Disciplinary Treatment of Shell Shock (Notes from German and Austrian Journals), Brit. M. J., Dec. 23, 1916.

51. Myers, C. S.: Contributions to the Study of Shell Shock, Lancet, Feb. 13, 1915; Jan. 8, March 18, and Sept. 6, 1916; abstr., Psychiat. Bull., July, 1917.

Some patients recover from their symptoms when the surgeons decide to undertake an operation. Some recover on being "bullied," threatened with courtmartial (S., 4th Co., B. S., S. C.), etc. "A few recovered their speech spontaneously, and a few did so after being harshly reprimanded and isolated from other patients."[52]

On the introduction of Wassermann tests as a routine procedure for all cases, many of our hysterical patients objected, and finally resorted to violent seizures in the laboratory. They created great disturbance, knocked the furniture about, broke glassware, and had to be held by several men. The situation was quickly controlled by the use of a whiff of ammonia "to revive" them. The patients claimed to have lost consciousness during the seizures; yet seizures have been seen to stop more than once when the chief of laboratory merely called out loudly, "Sergeant, bring the ammonia bottle!"

SPONTANEOUS CURES

Perhaps the most significant factor in the mechanism of cures is the one last mentioned in the enumeration—that of removal of motive actuating the symptoms by change in situation.

The patients which were sent to the Plattsburg hospital from overseas were for the most part those which had proved most refractory to treatment in hospital in France. Yet a great many of them had recovered spontaneously at the time they reached Plattsburg; and there was an outbreak of spontaneous cures following the signing of the armistice. Physicians who had succeeded in gaining a real insight into the mechanism of war hysteria had forseen this outcome long before it happened. The following was written in 1915:

> There exists at the present time a factor by which the prognosis of emotional war psychoses is radically biased: it is the war itself. The prospect of returning to the front constitutes, for many of the emotionally unstable, an obstacle to recovery of such power that it is impossible to say if it alone might not suffice to keep up the neuro-psychic symptoms and to impart to the disease the appearance of chronicity which has been noted in some cases. The fate of these patients will not be settled until peace has been signed.[53]

CIRCUMSTANCES CONTRIBUTING TO PREVALENCE OF HYSTERIA

That a desire to evade dangerous or difficult duty or all military duty should be prevalent in time of war is not surprising; but that it should so frequently lead to hysterical manifestations, i. e., invalidism without organic basis, requires some explanation.

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52. Myers, C. S.: Contributions to the Study of Shell Shock.

53. Rogues de Fursac, J.: Traumatic and Emotional Psychoses. So-called Shell Shock, Am. J. Insan., July, 1918. (English translation by A. J. Rosanoff.)

In this connection should be mentioned first of all the well-known gulliblity of the medical profession. Draft evaders seem to know that they need but to complain of a disability to gain the support of duly authorized medical officers. While to laymen the scheme of these patients is often clearly apparent, the tendency of medical men is to overlook or ignore underlying motives and mental mechanisms and to allow themselves to be imposed on. Far-fetched theories are propounded even by leaders in the profession. The following examples will suffice:

Dr. Grasset suggests as an explanation of the psychology of deaf-mutism that these patients probably think that they have died, as the only thing which unites such a patient to existence is the preservation of his sensibility and sense of movement.[54]

I believe this mutism is due primarily to an inhibitory functional paralysis of the voluntary cerebral nervous centers which control the management of the breath and direct its mode of escape through the glottis, mouth and nostrils.[55]

The disturbance affects the highest cortical levels, the middle levels with the subconscious mechanisms for everyday activities, the motor centers in the cord with their issue in the final common path, and the muscles themselves, and often also the afferent paths and the receptive apparatus for localization and the components of deep sensibility. . . . The disorder of voluntary movement may be explained by an overaction of the cerebellum, or by want of counteraction of the cerebellum owing to the impulse from the cerebrum being in abeyance.[56]

Continuous suppression or re-suppression, attended by continuous overstimulation of the instinct to action, brings about a stage of chronic hyperexcitability, resulting in physiological over-activity of the censor.[57]

May not paralysis, contracture, tremor, anesthesia, etc., be due to inhibition, or to exhaustion caused by excessive stimulation of the sense organs or nervous system, or to a molecular disturbance of some kind produced by vibrations in the equilibrium of the nerve cells?[58]

A double origin is postulable—a central and a peripheral genetic modus, i. e., psychic concussion and injury of the peripheral nerves. A violent impulse from external stimuli causes a functional disturbance of the delicate mechanism of the psychic centers, shown in (1) faulty distribution of motor impulses,

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54. Grasset, Joseph: Clinical Lecture on the Psychoneuroses of War, Med. Press and Circ., June 9 and 16, 1915; abstr. by H. Butts in U. S. Naval Med. Bull., January, 1916.

55. Mott, F. W.: Psychic Mechanism of the Voice in Relation to the Emotions, Brit. M. J., Dec. 11, 1915.

56. Clarke, J. M.: Some Neuroses of the War, Bristol Med.-Chir. J., July, 1916; abstr. by H. J. Norman, J. Ment. Sc., January, 1917.

57. Ballard, E. F.: Some Notes on Battle Psychoneuroses, J. Ment. Sc., July, 1917.

58. Sollier, P., and Chartier, M.: La commotion par explosifs et ses conséquences sure le systéme nerveux, Paris méd., Oct. 23, 1915.

(2) hypo-innervation, (3) hyper-innervation, causing tremors, tonic and clonic spasms, etc., instead of single muscle actions."[59]

The patient was a soldier who in August, 1916, became mute after the explosion of a grenade close to him. He was kept for forty days in a military hospital where various therapeutic measures were tried without success. He was discharged while still dumb, with ninety days' convalescence leave. He was arrested as a deserter perhaps because, when still suffering from the effect of the shock, he had left his regiment, and was condemned to imprisonment. He was sent to another hospital and on admission he was completely speechless, but his hearing was normal. He was placed under anesthesia and recovered speech; at first it was monosyllabic, but after a course of vocal exercises it became normal. In answering questions he stammered a little—a defect he had not had before his injury. That he was not a malingerer was shown by a certificate from the principal officer of the hospital where he had first been under observation that the condition was caused by an injury received in the service. . . . Chiadini said he could not believe that through the elective action of chloroform and ether on the lipoid substances of the brain, that organ suddenly passed from a state of inhibition to a normal extrinsication of thought with correct expression in words. . . . In all cases he believed that the centers of motor and sensory speech and their relation one with the other and with the periphery were intact; but one of the two centers was separated from the ideative center, and therefore from the whole of the remaining cortex; there was therefore an interruption of the association fibers going from the whole cortex to each of the speech centers."[60]

Undoubtedly the situation which makes it so easy for any shirker to evade duty by developing functional disability is not entirely due to gullibility of the medical profession. It is partly due to the difficult position in which medical officers are placed by military law.

It is one thing to convince oneself that in a given case there is no organic disease and only functional disability motivated by desire to evade duty or gain government compensation, and it is another thing to furnish such legal evidence as would convict a soldier of malingering in a court of law. Yet a medical officer has no other alternative than that of either designating the disability by some respectable name, such as "hysteria" or "psychoneurosis," or making a diagnosis of malingering and thereby being placed in a position of having to prove criminal intent on the part of the soldier.

The result is that, while every medical officer in the army has witnessed cases of malingering, the diagnosis of malingering is scarcely ever made. The present writer, for instance, during twenty months' service in Camp Upton and Plattsburg, witnessed many dozens of cases that he and other officers regarded as cases of deliberately

59. Oppenheim, H.: Der Krieg und die Traumatischen Neurosen, Berl. klin. Wchnschr., March 15, 1915.

60. Pansera, Guiseppe, and Chiadini: Un caso di mutismo da shock nervoso, Policlinico, Rome, Dec. 10, 1916.

feigned disability, yet in only one of them—to be described farther on—was an official diagnosis of malingering made, it having proved possible to get conviction on that charge before General Court Martial.

RELATIONSHIP BETWEEN HYSTERIA AND MALINGERING

This brings us to the question of the relationship between hysteria and malingering. Here it should be noted that opinions differ as to when a diagnosis of hysteria should be made and when one of malingering. Yet even those who hold diametrically opposite views are agreed that there is a close similarity in the clinical manifestations of the two conditions and great difficulty in establishing the differentiation in practice. The quotations which follow are from writers both on hysteria and malingering.

Quite the most difficult problem, however, is to differentiate a conversion hysteria from malingering.[61]

Cases of malingering are by no means always easy to diagnose, for there is no sharp dividing line between downright malingering, mere exaggeration, subconscious malingering, and actual disease; each class merges into the next.[62]

A most important function to be performed by a psychiatric service is the detection of true malingerers as distinguished from those soldiers who, because of psychopathic or neurotic conditions, may show almost identical indications and yet not be guilty of simulation.[63]

The subconscious influence of desires and wishes can often be demonstrated. The pathologic fraud, closely related to the hysteric, is sometimes found, and it is easy to understand why he appears more frequently in times of war than of peace.[64]

This multiform neurosis (hysteria) is not chosen by malingerers, but, more than any other disease, it renders the diagnosis of malingering extremely complicated and difficult.[65]

Appreciating the fact that the diagnosis and subsequent treatment of hysteria, neurasthenia, and malingering is made difficult by the merging of symptoms common to any two or all three of the conditions, the author cites illustrative cases giving the psychology of each in an attempt to clear the atmosphere.[66]

Nothing resembles malingering more than hysteria; nothing hysteria more than malingering. . . . We may examine an hysterical person and a malingerer—using exactly the same tests—and get precisely the same results in one case as in the other. The finer the methods that we employ to test the genuineness of their complaints, the reality of their objective phenomena, the

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61. MacCurdy, J. T.: War Neuroses, Psychiat. Bull., July, 1917.

62. Campbell, H.: War Neuroses, Practitioner, London, May, 1916.

63. Chavigny, P.: Psychiatrie et médecine legale aux armées, Paris méd., July 17, 1915.

64. Bonhöffer, K.: Erfahrungen über Epilepsie und Verwandtes im Feldzuge, Monatschr. f. Psychiat. u. Neurol., July-August, 1915.

65. Bailey, Pearce: Malingering in U. S. Troops, Mil. Surgeon, March and April, 1918.

66. Lumsden, T.: Psychology of Malingering and Functional Neuroses in Peace and War, Lancet **2**:860 (Nov. 18) 1916; abstr. by D. G. Sutton, U. S. Nav. M. Bull., April, 1917.

more do they—in hysterical individuals—yield results which in a non-hysterical person would be held as proof of positive deceit.[67]

The motives which I have found as constituting the mainspring of hysterical conduct are the same as those which students of malingering have uniformly reported as actuating their cases. Thus, Colonel Bailey[68] mentions, among others, the following motives in malingering: (a) to evade service, (b) to avoid duty, (c) to obtain exemption from punishment, (d) to obtain transfers.

Colonel Ford writes as follows: "Malingering is practiced to avoid unpleasant or dangerous duty, to secure hospital care and service, to make as much trouble as possible for those in authority, and to outwit them if possible. The chief causes are avoidance of danger and quest of a pension. . . . A successful malingerer promptly has a host of imitators."[69]

Jones and Llewellyn mention the following motives of malingering: (a) monetary gain, (b) to evade punishment, (c) to evade duty or responsibility, (d) to evade or escape military service. And they note the following manifestations: pain, hyperesthesia, anesthesia, analgesia, limping gait, tremor, contractures, paralysis, epileptiform seizures, amaurosis or amblyopia, contractions of the visual field, deafness, aphonia, stuttering, mutism, deaf-mutism,[70] etc. Colonel Bailey mentions similar manifestations.[71]

In the case of legally established malingering which has come under my own observation the manifestations were typical of hysteria: shuffling, labored gait, stocking anesthesia, weakness, pain in legs and tremor. The case would, indeed, have passed for one of hysteria, had not the patient procured a fraudulent roentgen-ray plate. He had fastened a piece of bone to the sole of his foot with a strip of adhesive plaster which made it appear on the roentgen-ray plate as a detached piece of bone in the metatarsal region, an easily exposed deception. He was tried before General Court Martial, found guilty and given twenty years.

DISTINCTION BETWEEN HYSTERIA AND MALINGERING

The question thus arises, What is the distinction between malingering and hysteria? A search through the literature reveals but one point to which the differentiation is fastened almost unanimously, namely,

67. Jones, A. B., and Llewellyn, L. J.: Malingering, Philadelphia, P. Blakiston's Son & Co., 1918, pp. 117 and 118.

68. Bailey, Pearce: Malingering in U. S. Troops, Mil. Surgeon, March and April, 1918.

69. Ford, J. H.: Details of Military Medical Administration, Chapter on Malingering, Philadelphia, P. Blakiston's Son & Co., 1918, p. 531.

70. Jones, A. B., and Llewellyn, L. J.: Malingering, p. 12.

71. Bailey, Pearce: Malingering in U. S. Troops, Mil. Surgeon, March and April, 1918.

the *conscious or unconscious quality of the motivation.* Yet even on this point writers have shown much inconsistency; for it is generally admitted that even malingering may be "subconscious" or "unconscious."

The cardinal point of difference is that the malingerer simulates a disease or a symptom which he has not in order to deceive others. He does this consciously. . . . He lies and knows that he lies. The hysteric deceives himself by a mechanism of which he is unaware and which is beyond his power consciously to control.[72]

It may require a rather exhaustive study to determine whether the symptoms are produced on the basis of a conscious or an unconscious wish, which is essentially the difference in etiology between malingering and hysteria.[73]

All hysterical manifestations are of the nature of unconscious psychical reactions, just as voluntary acts are conscious psychical reactions.[74]

Exaggeration, either conscious or unconscious, is the most common form of malingering.[75]

Malingering, as well as lying and deceit, far from being a form of conduct deliberately and consciously selected by an individual for the purpose of gaining a certain known end, is in the great majority of instances wholly determined by unconscious motives, by instinctive biologic forces over which the individual has little or no control.[76]

It is not always true that malingering is an acutely conscious reaction, as it is often beyond the awareness of the individual, occurring in the subconscious.[77]

It is strange that so futile a consideration, one so obviously belonging to the domain of metaphysics and not science, as the question of degree of consciousness of a mental process, should become the preoccupation of scientific men and should be chosen as a criterion of clinical diagnosis!

Everyone who has given the matter any thought must be aware of the great difficulty of defining to oneself the motivations of even the simplest volitional processes. Such self analysis requires special skill and training in introspection; and even under the best conditions the data that thus become available can perhaps never become a part of the material of science, being serviceable only as *leads* to problems in psychology.

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72. Salmon, T. W.: The Care and Treatment of Mental Diseases and War Neuroses ("Shell Shock") in the British Army, New York, The National Committee for Mental Hygiene, 1917.

73. MacCurdy, J. T.: War Neuroses, Psychiat. Bull., July, 1917.

74. Jones, A. B., and Llewellyn, L. J.: Malingering, p. 117.

75. Jones, A. B., and Llewellyn, L. J.: Malingering, p. 59.

76. Glueck, B.: The Malingerer; a Clinical Study, Internat. Clin. **3**: S. 25, 1915.

77. Sheehan, R.: Malingering in Mental Disease, U. S. Nav. M. Bull. **10**: 646 (October) 1916.

One may, indeed, have an illusion of lucidity of consciousness; but he needs only to attempt a *formulation in language* of the results of his introspection to convince himself of the darkness within.

When we are dealing with weak-minded, ignorant, emotionally unstable, morally defective individuals, such as hysterics and malingerers; and when, moreover, the question is one of "conscious," "coconscious," "preconscious," "foreconscious," "subconscious," or "unconscious" *deception*, it is all the more amazing that a criterion, which is, in the first place, vague, and, in the second place, purely subjective, should seriously occupy the professional mind as a guide in practical work.

But there is more to add to the confusion. A case, it is said, may begin with conscious deception and end with unconscious self-deception; or vice versa; or there may be a mixture of unconscious and conscious simulation (i. e., hysteria complicated with malingering); or there may be a condition half-way between conscious and unconscious simulation.

M. Gilbert Ballet points out that a man may begin by shamming, and, as the result of auto-suggestion, end by developing the condition simulated, thus becoming the victim of his own chicanery.[78]

Hysteria, when prolonged for months, is very apt to have malingering grafted on it, and what was at first a purely psychical disturbance of function may ultimately be perpetuated mainly by the intention to deceive.[79]

One has to recognize the fact that a genuine hysterical person may for purposes of gain resort to simulation.[80]

This condition (so-called guard house back or camptocormia), in which the back is held stiffly forward or laterally, is frequent in our army. . . . It is generally regarded as midway between malingering and hysteria.[81]

While it is in the nature of things that the motives actuating hysterical conduct should be, for the most part, concealed, this fact can by no means be regarded as proof of their being beyond the awareness of the patients. Occasionally they are either confessed or detected in other ways which show their clearly conscious nature, as in the following cases:

1. "To be honest about it, if I could get out of the army I would like it; now that's the truth. My half brother has a big farm, about seven or eight hundred acres of land and his wife is sick; and he has been at me to come and live with him, sort of look after his farming, his horses, and so on." (S., 7 Truck Co., 23 Eng. Case of hysteria characterized by pains in head and back, dizziness, amnesia, paralysis of legs, stammering, weakness, fatigability; cured by "the most earnest prayer.")

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78. Campbell, H.: War Neuroses, Practitioner, London **96**:501 (May) 1916.

79. Harris, W.: Nerve Injuries and Shock (Oxford War Primers), New York, Oxford University Press, 1915.

80. Jones, A. B., and Llewellyn, L. J.: Malingering, p. 129.

81. Bailey, Pearce: Malingering in U. S. Troops, Mil. Surgeon, March and April, 1918.

2. "I know I never worked hard in my life. If you'se want to discharge me I could work in an ammunition factory or something like that. I could go home then and be near my girl; I know I'd be more contented then. I might as well tell you the truth; no use of me lying." (D., 301 Co., Q. M. C. Case of hysteria characterized by limping gait, attacks of excitement.)

3. "About 6 o'clock on the night of April 12, on my way to the watch post—well, I can't say that I was blown up because I heard no explosion, and did not see the trench cave in, and had no blood drawed on me except a slight scratch on my back—I became unconscious, but I do not know the cause of my unconsciousness. When I came to I found myself between 30 and 40 feet in front of the trench in no-man's land. I managed to crawl back into the trench by using my hands and arms: I could not use my legs, as I had lost the use of both of them completely." The following version was later obtained by correspondence from First-Lieutenant Harold P. Gibson, 23 Inf., A. E. F.: "On April 12, 1918, while I with B. (the patient) and Corporal Hiller, both of my platoon, was inspecting outposts, B. suddenly stopped, fell against the side of a trench and told me he had no control over both his legs. He had to be carried to the battalion first-aid station and was then evacuated. B. had, during all the time that I knew him, been troubled with the arches of both feet." (B., Co. C, 23 Inf. Case of hysterical paraplegia, areas of anesthesia, violent tremors, globus, etc.)

Among other points of differentiation between hysteria and malingering which have been suggested are: 1. Result of treatment by persuasion, i. e., if persuasion fails to cure the case is not hysteria but malingering (Babinski). 2. A desire to be cured speaks for hysteria; the opposite indicates malingering. 3. The malingerer dreads examination; the hysteric welcomes it. 4. Hysterical manifestations bear the stamp of a certain genuineness which those of malingering lack. These points merit somewhat detailed discussion.

As regards result of treatment by persuasion, it is very generally recognized that in many cases which are by all diagnosed as typical hysteria persuasion fails to cure—so-called refractory hysterics. In other cases, also refractory, a cure is, indeed, obtained by persuasion but only when it is reinforced with painful electrical treatment (Kaufmann method, "torpillage"), ammonia, isolation and liquid diet, threat of operation, threat of court martial, etc.

It is true, of course, that many cases of hysteria have readily yielded to persuasion; but the conditions under which that has happened should be taken into account. When the danger was removed of being returned to the front, especially, as already stated, after the signing of the armistice, many cases were not only easily "persuaded," but were cured by any method that happened to be tried, though they had previously proved refractory. The cure in these cases is obviously to be attributed not so much to persuasion as to the removal of the danger. Some patients have remained refractory even since the signing of the armistice; in these cases the actuating motive is to gain government compensation; that is the reason why the "persuasion" that has cured thousands of others is doing them no good.

Moreover, proved malingering has also in many cases yielded to persuasion, while other cases have proved refractory; in other words, the experience with malingering, in that respect, has been exactly like the experience with hysteria. I would cite, in this connection, the observations of Sicard.[82]

> In six cases the deception was detected by the mild method *(méthode douce)*. This consists in appealing to the pride of the patients, avoiding all suggestion of reproach, all criticism in public, and, above all, any accusation of malingering before a third party. We take them aside, and make them realize the unworthiness of their conduct. We appeal to their patriotism and prescribe an electric treatment to serve as pretext for a rapid cure. We have had, from some at least, expressions of real regret and remorse for their actions. These men were returned to the army. Two of them have written to us since and are giving good service at the front.
>
> But other malingerers, those of fixation as a whole, remain inflexible. They exhibit an impervious obstinacy. One feels that all persuasion is useless, that every appeal to their better nature, to their moral sense, is vain. There is no worse deafness than that which is resolved not to hear. The only recourse is threat *(la maniére forte)* of court-martial, or at least of appearance before court-martial.
>
> The author describes in a note an interesting case of malingering in which a soldier terminated a period of ten months without a spoken word by a well-acted seizure in which speech and hearing supposedly returned to him. He confessed his trick later in a letter, but promised to atone for it by his future conduct—a promise which he is keeping.

Babinski's differentiating test of cure by persuasion is based on his general conception, according to which the essential feature of the hysterical personality is abnormal suggestibility. But a close scrutiny of the facts does not support this conception. An equally plausible case might be made out for abnormal *lack* of suggestibility.

Under certain conditions the hysteric is, indeed, remarkably receptive to *certain* suggestions; but he is at the same time refractory to others. When he has to play sick in order to avoid dangerous duty he will not only be readily influenced by suggestions unwittingly made by the examining physician in testing for disorders of sensation, etc., but will actually seek suggestion by observing cases of real disease and will develop by autosuggestion such symptoms as he may imagine to be appropriate for a "dead nerve," "stoppage of circulation," etc. At the same time he is apt to resist any suggestion of cure.

But a time comes when, on removal of danger, the situation changes. What was previously a life-saving disability now becomes a nuisance. Although many are, in the new situation, cured spontaneously, others feel that a sudden cure without treatment would but betray the false nature of the trouble. Nothing is more natural than that they should

82. Sicard, J. A.: Simulateurs sourds-muets, Paris méd., Oct. 23, 1915.

again seek the cooperation of our gullible profession to assist them in making a seemly and plausible exit from an awkward situation. And so after taking electricity, hypnosis, reeducation, vocal exercises or what not, accompanied by "suggestion," they are pronounced cured; this carries with it not only relief from no longer serviceable disability, such as mutism, paralysis, contracture, etc., but also, by implication, added certification by duly constituted medical authority that a disease had existed.

Turning now to the next point of differentiation, according to which a desire to be cured speaks for hysteria, while the opposite indicates malingering, I have to say that no generalization in this respect can be made which would hold true for all cases of hysteria; everything depends on special features in a given case and on special circumstances.

Every practitioner knows the service a nervous illness often is to a patient in dealing with relatives, over whose head the patient holds it almost as a threat; this process may be consciously or unconsciously carried out. Under such circumstances the patient's deep-rooted objection to getting better may defy all therapeutic measures.[83]

I have seen cases in which stubborn resistance to treatment gave way, following the signing of the armistice, to an impatient longing to get well. The following is a good example: "Oct. 7, 1918, electro- and hydro-therapeutic treatment discontinued because patient resists everything done for him and is sure nothing will help him. October 14, no improvement. October 24, no improvement. November 8, no improvement. November 18, transferred to Plattsburg."—(From the clinical record at Walter Reed General Hospital.) "This complete paralysis of the leg had continued for several months in spite of all efforts in one of the best French hospitals to effect a cure. He had been given some of their most drastic electrical treatment without obtaining any response. His desire to get well has been so great that after hearing another patient remark that he had been able to walk after falling down a flight of stairs, he tried a like cure on himself by throwing himself down a flight of stairs. In the first treatment, combined faradic-galvanic current, applied to the left foot, we were able to develop some voluntary motion. After the third treatment he was able to walk without crutches. In the course of about two more weeks (Jan. 3, 1919) he was discharged, cured."—(Report of Capt. Claude D. Kellam, M. C., chief of physiotherapy department, U. S. Army General Hospital No. 30, Plattsburg Barracks, N. Y. Case is that of S., Co. I, 103 Inf.)

The next alleged differentiating point, according to which the malingerer dreads examination, while the hysteric welcomes it, is, as far as my experience is concerned, untrustworthy. In the case of malingering cited above the patient at all times willingly submitted to neurologic examinations in which the areas of anesthesia were repeatedly mapped out, etc. Under similar conditions hysterics, too, welcome examination.

83. Jones, Ernest: Papers on Psycho-Analysis, New York, William Wood & Co., 1918, p. 354.

But I have many times seen hysterics cease to cooperate and become resistive to examination on a suspicion arising in their minds that the object of the examination is to test the genuineness of the symptoms. This was especially noted in cases of convulsions, in which the patients by turning away, biting, struggling, and fighting resisted an examination of the pupils, knee jerks, plantar reflexes, etc.

The last mentioned differentiating point, according to which hysterical manifestations bear the stamp of a certain genuineness which those of malingering lack, is also not to be relied on. All that can be said is that in both hysteria and malingering one meets with various degrees of adroitness in simulation, various degrees of determination and persistence.

Macdonald tells of a man, feigning epilepsy, who during a fit suffered without flinching knives thrust under his nails, the insufflation of irritating powders into his eyes, and one day fell 30 feet to convince the expert, though finally he acknowledged his deceit.[84]

To sum up: my own experience, much discussion with other medical officers, and a study of the literature on the subject under consideration, all lead me to the conclusion that *what some have described under the name of hysteria and what others have described under the name of malingering are one and the same thing.* The difference seems to be entirely one of viewpoint.

"Hysteria" is an expression which would stress a medical viewpoint. "Malingering" is one which would stress a legal viewpoint.

SEX FACTORS—INTRAPSYCHIC CONFLICTS

There remain two other point in connection with hysteria which merit discussion in the light of the war experiences: (1) the part played by sex, (2) the theory of intrapsychic conflicts.

Although Freud's views as to the exact part played by sex factors in hysteria have undergone considerable modification from the time of his original formulation nearly twenty-five years ago, even in his recent formulations the sex element is regarded as essential in the etiologic mechanism. The hysterical symptom corresponds to the return to a manner of sexual gratification which was real in infantile life and which has since been repressed. The hysterical symptom can assume the representation of various unconscious non-sexual impulses but cannot dispense with a sexual significance.[85]

It seems quite probable that, in relation to a certain variety of material, the idea of the universality of sex factors is well founded. The sphere of sex, under ordinary conditions, might even *a priori* be

84. Jones, A. B., and Llewellyn, L. J.: Malingering, p. 48.

85. Freud, S.: Sammlung kleiner Schriften zur Neurosenlehre, 2nd Ser., 1909, pp. 142, 143, 150; cited by Pfister, O.: The Psychoanalytic Method, New York, Moffart Yard & Co., 1917; transl. by C. R. Payne.

regarded as the main if not the sole source of "concealed, illicit, morally untenable motives" postulated by me as the mainspring of hysterical conduct. But the war experience has shown even to loyal adherents of Freud that hysterical manifestations can be actuated by motives other than sexual.

> Psychoanalysts in civilian practice claim that the individualistic tendencies in question are preponderantly related to the sex instinct. In war, however, this does not seem to be the case, these latter tendencies coming into play, apparently, only as a complication.[86]
>
> The psychoneuroses of peace time are usually the result of mental conflicts between repressed instinctive tendencies and the demands of civilized life. The instinct most often involved is the sexual. In the psychoneuroses of war time, however, we find that the conflict is usually between the soldier's ego instincts (particularly that of self-preservation) and the demands of military service.[87]

Even in peace times, neurologists have seen but too often hysterical manifestations ("traumatic neuroses") arise on the basis of exaggerated claims for indemnity, sick benefit, accident insurance, workmen's compensation, etc., without the intervention of sex motives.

It seems, therefore, justifiable to conclude that an illicit motive is an essential part of the mental mechanism of hysteria; but such motive need not be of a sexual nature, although undoubtedly it very often is.

In most other respects, what I have seen of hysteria in the course of my war experience bears out Freud's conception of its underlying mechanisms more fully than any other pre-war conception. I would cite here the well formulated presentation by Ernest Jones:

> Neuroses are not diseases or accidents that happen to a person, as the French school of psychopathology maintains, but are phenomena produced and brought about by some tendency in the person's mind, and for specific purposes. Freud distinguishes three classes of motives that operate in this way, one essential, the other two not. The indispensable one is an unconscious desire to obtain pleasure by gratifying in the imagination some repressed and disassociated impulse, a motive, therefore, arising in the part of the mind that is not in harmony with the ego-ideal. A second motive is to achieve some end in the outer world; for instance, sympathy from an unkind husband, which the person finds easier to do by means of a neurosis than in other ways. The third set of motives has the same purpose as the last, but may be distinguished from it in that they concern the making use of an already existing neurosis rather than the helping to bring one about.[88]

Turning now to the subject of intrapsychic conflicts, it will be remembered that the manifestations of hysteria are regarded by some as a

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86. MacCurdy, J. T.: War Neuroses, Psychiat. Bull., July, 1917.

87. Payne, C. R.: Special Report on the Applications of Psychoanalysis to War Neuroses at U. S. Army General Hospital No. 30, Plattsburg Barracks, N. Y.

88. Jones, E.: Papers on Psycho-Analysis, p. 573.

sort of compromise resulting from a conflict between repressed, subconscious wishes and the patient's conscious tendencies representing the better part of his "split-up personality."

> Flight or desertion is rendered impossible by ideals of duty, patriotism, and honor, by the reactions acquired by training or imposed by discipline and by herd reactions. Malingering is a military crime and is not at the disposal of those governed by higher ethical conceptions. Nevertheless, the conflict between a simple and direct expression in flight of the instinct of self-preservation and such factors demands some sort of compromise.[89]
>
> The manifestation of abnormally repressed mental processes is to be understood only by consideration of the action of intrapsychical conflict. . . . The energy finds an outlet in some somatic manifestation, a process Freud terms "conversion." This is the characteristic mechanism underlying hysterical troubles, where a given bodily symptom, such as a tremor or an aphonia, is the expression of a repressed mental complex.[90]

I can confirm, from such observations as I have been able to make, the existence of a conflict. But it has seemed to me to be, for the most part if not entirely, a conflict rather between the patients' desire to shirk, loaf, avoid exposure to danger, gain unearned compensation, etc., and pressure from external sources the object of which might be to expose their motives and the unreal nature of their disability, to bring on them the opprobrium of their comrades, to render them liable to legal prosecution, etc.

In other words, I was unable, in the great majority of cases, to detect any pricking of conscience, evidence of regret at being a burden rather than a help to their country in its great emergency, any struggle between nobler and baser parts of self, but rather a general lack of evidence of the existence of a nobler self in these cases.

This brings us to the subject of the hysterical personality.

THE HYSTERICAL PERSONALITY

I have already endeavored to show that hysteria is but one of a number of varieties contained in the large group of neuropathic constitutions. The family and personal histories of hysterics indicate some sort of relationship to the constitutional psychoses, epilepsy, mental deficiency, constitutional psychopathic states, etc. But the hysterical personality can be more specifically defined. Its essential feature, it seems to me, consists in a *character defect*. In the moral side of our nature three motivating principles can be distinguished, each of which actuates our conduct in a measure which differs in different individuals.

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89. Salmon, T. W.: The Care and Treatment of Mental Diseases and War Neuroses ("Shell Shock") in the British Army, New York, The National Committee for Mental Hygiene, 1917, p. 30.

90. Jones, E.: Papers on Psycho-Analysis, p. 23.

The first of these may be termed pure or esthetic morality; it is represented in the saying "It is better to be right than to be president." No considerations of selfish advantage, of mere catering to popular taste or demand, are here permitted to enter. A person actuated by this principle turns away from thoughts of deception, theft, dishonesty, or any other moral filth, just as he might, from inherent esthetic repulsion, turn away from a foul smell.

The second principle may be termed prudent morality; it is represented in the saying "Honesty is the best policy." Unlike the case of the first principle, here considerations of selfishness and personal ambition not only are permitted to enter, but are the basis of doctrine. A person actuated by this principle turns away from wrongdoing not from an esthetic aversion, but because of a conviction that, in the long run at least, it does not pay.

The third principle, imposed morality, has its roots in the deterrent force of such measures of redress, retaliation, or protection as are available to individuals and society in dealings with wrongdoers. A person actuated by this principle has no esthetic aversion to wrongdoing; and he regards the maxim of prudence with cynicism. His preoccupation is, mainly, how to escape detection, conviction and punishment. If he refrains from wrongdoing, it is only when the risk involved is too great and too immediate.

I could not better define the hysterical personality, as I have observed it, than by saying that it is characterized by total lack of the first principle; that it is at best actuated by the second principle; and that it is, in its typical manifestations, actuated entirely by the third principle; i. e., in so far as its conduct has any moral quality at all.

This places the hysterical individual in close relation to the criminal. Yet a certain difference may be pointed out. Most hysterics are characterized by a trait which is foreign to many criminals: indolence.

A desire to lead a parasitic existence, to be a burden on relatives, employers, the government, to live on a pension and do no work, is characteristic of many of these patients. They would, and often do, steal anything conveniently within reach, lie, cheat, make work and trouble for others, wantonly destroy government property, but they haven't the enterprise or energy that some criminals have of planning and carrying out an embezzlement or a burglary or a train robbery: That is too much like work.

This description may seem to some much overdrawn. I would, therefore, again note that the above described traits of hysterical personality exist in all degrees. Between the man of highest integrity, actuated only by the purest motives of unselfish service, and the one who utterly lacks all moral compunction and is constantly preoccupied

with motives of shirking and of organizing a parasitic existence, there are many shades of transition.

It should, moreover, be borne in mind that the material observed in the Plattsburg Hospital, on which this study is based, represents, by selection, the most refractory cases of hysteria met with in the army. The reader will recall that of 100 so-called concussion and nervous cases received at triages near the front, sixty-five were returned to duty within a few days and thirty-five were sent to army neurological hospitals. Of the latter, twenty were later also returned to duty and fifteen sent to Base Hospital No. 117, at La Fauche, in the Service of Supplies. Eventually fourteen of even this group were returned to duty and but one sent back to the United States.[91]

My comments refer particularly (a) to this 1 per cent. of cases, weeded out from amongst all concussion and nervous cases on the basis of their stubborn resistance to treatment and total unfitness for duty and, (b) to a small number of still more flagrant cases that had arisen in the domestic cantonments. To what extent generalization from my conclusions might be valid is, of course, another question.

The statistical analysis, in the beginning of this section, of two selected groups of cases of hysteria, demonstrates differences in degree. Analyses of individual cases present such differences even more strikingly.

One man, for instance, gives up a well paying position and enlists voluntarily in the Signal Corps with the hope of "helping in the war and at the same time maybe learning something," though determined to avoid, if possible, combatant duty or exposure to any danger. Following an unexpected order to prepare for embarkation for overseas he develops violent coarse tremors and fainting attacks which persist until his transfer is arranged to the medical department with assignment to duty in the Plattsburg hospital. Thereupon, being assured of the removal of the danger of exposure to submarine attack, etc., he makes a prompt and complete recovery, and renders daily extremely valuable and conscientious service as office assistant. (R., Co. G, 321 F. S. Bn.)

In contrast with this case may be cited that of a man who became inspired with the idea of utilizing this rare opportunity of securing a life pension. With that in mind he enlists and two weeks afterward develops, from an alleged injury due to being struck in the groin by a case which he was carrying, a stooped over position, so-called camptocormia. Shortly afterward he is operated on for varicocele, and this aggravates his disability. Thereafter he spends over fifteen months, i. e., the remainder of his "service" in the army, in hospitals or on furloughs for his health, does no work, makes all kinds of trouble for the authorities, declares he can never be cured, demands discharge on certificate of disability: "If the government is afraid of a little compensation, I don't think it is treating the soldier boys very fair." (S., 4th Co., B. S., S. C.)

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91. Editorial, Mental Hygiene, January, 1919.

NEW DESIGNATION SUGGESTED FOR HYSTERIA

From all that has been said above, the reader can almost surmise the view to which the war experience has led me. I feel, on the one hand, that the practice of camouflaging the true nature of the conditions here dealt with by means of such euphemisms as hysteria, war neurosis, concussion neurosis, traumatic neurosis, shell shock, etc., and thus, through implied authoritative professional support, imparting to them a stamp of respectability, is bad in every way. On the other hand, in view of the fact that, whether conscious or unconscious, simulation of disease occurs on a basis of inborn neuropathic constitution, it cannot be encompassed within the simple formula of malingering, i. e., crime, the responsibility for which is entirely on the patient. I would banish from medical classification the above named terms and others like them and designate the cases in question *constitutional psychopathic state, simulation.*

NEURASTHENIA

The cases classed under the heading of neurasthenia may be roughly divided into two groups which are superficially very similar to each other but which, on closer study, may be found to present wholly different psychic mechanisms.

The first of these is characterized by depression, discouragement, difficulty of concentration, feeling of inadequacy, and psychomotor retardation—in other words, it is a condition apparently allied to the manic-depressive psychoses.

The second is characterized by vague general hypochondriasis with purely subjective symptoms, and may often be shown to be motivated exactly in the manner of the above discussed hysterical manifestations. It is, to my mind, but a special type of hysteria or simulated disease. It is apt to be seen in persons presenting the same sort of character defect as that which underlies common hysteria, but endowed with better intelligence, of better education, more polished and diplomatic, more suitable and plausible. Thus I find it relatively more frequent in commissioned officers than in enlisted men.

My experience has amply shown that the possession of native intelligence far above the average and good educational and social opportunities are not incompatible with gross lack in moral sentiment. The following cases are cited for illustration.

1. An officer who had been under suspicion and surveillance was later reported in France for what seemed to be pro-German propaganda. He had stated that enormous supplies had been abandoned by the Allies to the Germans in the spring of 1918; that the French troops had become utterly demoralized; that he had been directed to place time bombs for the destruction of the supplies of the Allies in the event of further advance by the Germans; that the fall of Paris was only a matter of days; that the Germans had a tremen-

dously powerful new explosive, etc. He was placed under arrest on June 5, 1918; later, following examination by a psychiatrist, he was declared not fully responsible and returned to the United States as a nervous patient (K., A. S. S. C.).

2. An officer who gave a history of fainting spells and other epileptiform manifestations which, he said, began after he had been gassed in France, showed nothing on examination. Aside from his history there was no evidence of epilepsy and no record of his having been observed in seizures of any kind. Shortly following his admission to this hospital, papers were received showing that he had been charged with a serious offense in France and had disappeared for a time. His whereabouts were for a time unknown, but he appeared in Field Hospital No. 6, later placed in Class "D" by medical officers and returned to the United States (R., 4 Eng.).

STRIKING CASE DEMONSTRATING THE REMARKABLE STABILITY OF A NORMAL NEUROPSYCHIC CONSTITUTION

On Nov. 18, 1918, a group of men, survivors of the torpedoed transport Ticonderoga, were admitted to the Plattsburg Hospital. It would seem that nothing that happened in the war was more exhausting, horrifying, depressing, and nerve racking than the experience of the men on the Ticonderoga. The abridged account furnished by one of these men is herewith submitted. This case is instructive in that it shows what remarkable stability a normal mental constitution has and how inadequate etiologically, in the absence of a neuropathic predisposition, are the factors to which so often psychoses and neuroses are attributed.

H., white, aged 18; previous history negative; enlisted July 15, 1918, and sailed for overseas Sept. 18, 1918. The transport was shelled, torpedoed, and sunk on Sept. 30.

At about 5 o'clock in the morning, patient was in his bunk with all his clothes on but his blouse and shoes; he was suddenly awakened by the bell signal "to life boats" and by the noise of constant shelling. He slipped on his blouse, shoes and life preserver; as he reached the deck he saw one shell knock the 3-inch gun off the platform and kill the gun crew; he was knocked down by the jar though not hurt or rendered unconscious; started toward the upper deck, the shelling going on all the time; one shell exploded about 10 or 15 feet from him; this time he was rendered unconscious and, on coming to about five minutes later, found himself in a narrow passageway into which he had been thrown. He had a violent headache, was gasping for breath, shaking violently all over, and found that his hands, arms and body had been sprayed with minute particles from the exploding shell, which were so hot that his clothing was charred or burned through where they struck. For about an hour he assisted in preparing the life-boat for lowering, loading it with blankets, etc., the shelling going on all the time. The submarine was seen about 200 yards away; the bridge had been partly blown down; shells were seen striking various parts of the ship and throwing up and killing men; some life boats which had been lowered were struck by shells and sunk; others were dumped on account of being lowered in a hurry; wounded men were all over the deck, and many, both wounded and not wounded, were in the water;

one man had had his nose shot off and received a gash in the back of his head; he approached the patient and asked that he kill him. There was a good deal of shrieking and groaning, although most noises were drowned in the noise of constantly exploding shells. Then a big blaze was seen over what was left of the bridge and all men were ordered to fight the fire on the bridge. The shelling stopped for about twenty minutes but started again from the other side. While lowering their life boat a shell killed the paymaster, a sergeant, a private, and some others who were standing there waiting to get in. No other life boat succeeded in getting away and only one raft. In the meantime the *Ticonderoga* was struck by two torpedoes and finally sank, carrying with it the wounded on board.

When they began rowing away with their life-boat there were twenty men in it. In a few minutes they saw the submarine coming toward them. The captain (Capt. M., ranking as Lieut.-Com. in U. S. Navy) said, "Well, we shall die like men!" (He had been severely wounded in both legs, with face bleeding, and part of the time unconscious; later at times delirious.) At the same time they rowed toward the submarine and soon came alongside of it. One of the submarine officers asked them first, in broken English, if they were armed; one ensign and one soldier were then taken on board the submarine; in the meantime the life-boat was tied by a tow rope to the stern of the submarine; then the submarine submerged, but fortunately the knot became untied and the life-boat was left afloat with eighteen men in it, of whom five had been wounded. They floated around all day; at about 3 o'clock in the afternoon sighted a raft, and toward 5 o'clock came near enough to it to throw a rope to the men on it; there were ten men on the raft, some of them wounded; they had no water or rations. Five of the men from the raft succeeded in getting into the life-boat; it was not considered safe to permit any more to come in. They planned then to tow the raft so as to have the men near enough to give them rations, but the raft slipped away, and they lost sight of it. One of the wounded men in the life-boat died that evening and his body was thrown overboard. The first two days and nights it was rather rough and it rained; it kept two men busy all the time baling. The canvas covering the boat had to be held down at the gunwale to prevent being swamped by a wave; the sail that had been put up had to be held by a rope and managed as was necessary. Two of the severely wounded men lay in the bottom of the boat and got a little sleep; but the remaining men got no sleep whatever in the four days and three nights.

During the first night the patient and several of the others kept vomiting small quantities of greenish liquid. Nobody seemed hungry, and they ate nothing until the afternoon of the second day, about 3 o'clock, when they had one apricot, one small hard-tack, and some apricot juice mixed with water —only a tablespoonful of that mixture to each man. Everybody was thirsty, but only small quantities of water were given out, and those only at meal times. The third and fourth days they had one meal each, same as above and, in addition, one-fourth of a thin slice of bologna. All the time they were shaking with chilliness and were sopping wet. The fourth day, however, was much calmer, sunny and warm, and they got dried out and warmed up. At noon on the fourth day they sighted a ship *(The Moorish Prince)* in the distance and at 3 o'clock they were taken on board.

The patient suffered from headache, great weakness, shook all over, and had pain in the back from cramped position; he was also famished and extremely thirsty. The others were in the same condition. They got some

whisky, were cautiously fed and were placed in warm bunks. The patient's sleep was disturbed by dreams of shelling, etc., and he would start suddenly; also every noise, especially the boat whistle, would wake him with a start; although he was able to be up and around, he lay in his bunk the greater part of the time.

On Sunday, October 6, their fourth day on the freighter, H., with others, was transferred at sea to a British transport and reached New York on October 10. He was taken to the U. S. Army Debarkation Hospital at Ellis Island, New York City; after two nights there the patient was transferred to Camp Merritt, N. J. He complained of headaches daily, nervous shakiness, bad dreams and being readily startled by noises. On November 17, he was transferred to the Plattsburg hospital.

Physical Examination on Admission.—His height was 67½ inches, his weight 139 pounds in ordinary clothing. (His usual weight is 150 pounds.) The patient stated that he tires easily. He had rather pronounced tremor of hands and eyelids. (Two days later the tremor was greatly reduced.) The grips were equal but rather weak. Findings otherwise were negative.

Mental Examination.—"I feel quite well now; I still have headaches, but not very often. At times I have a feeling of longing and worry due to the fact of being away from home and facing death as I did and not having seen my people. The dreams that I have now are only like those I used to have before. I am not fit for full duty, but could do light duty and I think I would be able to work up to full duty before long." His attitude and manner were entirely normal. The patient asked for his clothes and to be given something to do. He adapted himself well to the hospital routine; presented no emotional disturbance, disorder of flow of thought, oddities, hallucinations or delusions. Orientation, memory, grasp on general information were intact. He was unable to recall any dream.

PSYCHO-ANALYSIS IN WAR NEUROSES

The Plattsburg hospital has been fortunate in having on its medical staff an able exponent of psycho-analysis, Dr. Charles R. Payne. The report submitted by him contains conclusions which are worth noting:

Psychoneuroses of war differ from those of peace in: (1) the conflict involves the ego instincts rather than the sexual; (2) in the war psychoneuroses the conflict is much nearer the surface of consciousness. Psychoanalysis is not practicable in treating cases of war psychoneuroses among private soldiers for three reasons: (1) too much time required; (2) patients during war lack real desire to get well; (3) majority of patients are not of sufficiently high intelligence to be suitable for psychoanalysis. Psychoanalysis is of great value in treating psychoneuroses among officer patients.

LESSONS FOR CIVILIAN PRACTICE

War neuroses and malingering in the army have their counterparts in civilian life—hysteria and the so-called traumatic neuroses. The problem of "traumatic neuroses" is very likely to grow to vast proportions with the progress of legislation for workmen's compensation, accident insurance, sick benefit funds, etc. It would seem that the interests of society, insurance organizations, public service corporations,

etc., should be protected by amending legislation so that, while providing fully for compensation in cases of actual injury or disease, it should render the subject of purely functional, mental, simulated disability or disease entitled to no indemnity but only to examination and treatment in a hospital for a limited period of time.[92] The removal of temptation would result in greatly lessening the incidence of simulated disability or disease.

SUMMARY

1. Hysteria is purely functional in its nature and the mechanisms underlying its manifestations are entirely mental.

2. By way of preliminary to the discussion of my own experience a brief restatement is offered of pre-war current conceptions of hysteria.

3. An analysis of two selected groups of cases of hysteria is offered —fifty cases in each group. This analysis leads to the following conclusions: (*a*) Hysterical phenomena are a special group of manifestations arising on a basis of neuropathic constitution. (*b*) Neuropathic heredity is probably the essential factor in the eitology. (*c*) The frequent occurrence of dissimilar heredity and, in the patients themselves, or neuropathic traits not specifically hysterical, points to a relationship of some sort between hysteria and other manifestations of neuropathic constitution. (*d*) The hysterical tendency varies widely in degree and shades off toward normal constitution by gradual transition.

4. Causes to which patients attribute their hysterical symptoms are obviously and absurdly inadequate; they are, at most, occasions out of which have arisen suggestions in part determining the particular symptomatology.

5. Various causes assigned by medical officers are enumerated. With the progress of the war, the view gained ground that physical factors, as such, played no part in the etiology of hysteria.

6. In studying the etiology of war neuroses, it is important to distinguish the acute emotional disorders observed at the front from hysteria.

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92. Recently the head of the medical department of the French army requested the advice of the Société de Neurologie de Paris concerning the proper medicomilitary disposition of cases of hysteria still under military jurisdiction. The answer was threefold, the third part being: "In general, purely hysterical manifestations entitle one to no recompense. Exceptionally, a percentage of disability may be allowed somewhere between zero and 20 per cent., but in no cases shall the latter figure be exceeded" (Rev. neurol., 1919, No. 3). From this it would appear that the opinion of the members of this learned society does not much differ from mine.

7. According to Léri, it is a mistake to think that hysterical manifestations are an integral and necessary part of the emotional syndrome; they can appear independently of all emotion; and the emotional syndrome has nothing in common with hysteria.

8. Psychic factors to which war neuroses in general have been attributed—fright caused by danger from projectiles, horrifying sights, etc.—play a part only in the acute emotional syndrome; hysterical phenomena are not directly produced by them.

9. Those disorders which developed at the front and are the direct expression of violent emotion are never of long duration; the intensity of their manifestations subsides rapidly and almost all cases can be returned to the front within a few days.

10. Speaking with special reference to my experience, the mainspring of hysterical conduct consists in a concealed, illicit, morally untenable motive.

11. Its most frequent variations are: (*a*) To evade the law of conscription, (*b*) to procure, on reporting for physical examination at a training camp, rejection for physical unfitness, (*c*) to evade dangerous, disagreeable, or difficult duty, or to evade all duty, (*d*) to procure the ease and privileges of hospital care, (*e*) to procure discharge on certificate of disability, (*f*) to procure compensation for disability.

12. That illicit motive and it alone is the factor which actuates hysterical conduct, is further shown by the following three groups of facts: (*a*) Many cases have arisen in National Army cantonments in this country very early in the course of training. (*b*) Among prisoners of war who have been, like other soldiers, exposed to shell fire, strain, etc., scarcely any cases of hysteria or other psychoneuroses have been observed. (*c*) Very often quick and complete recovery from hysterical, symptoms, having occurred on evacuation to a base hospital, is followed by a return of the symptoms in the same or even a greater degree of intensity, or by development of new symptoms, on any prospect arising of being sent again to duty.

13. Statements which have been made to the effect that war neuroses had not been observed in previous wars in such large numbers are probably not in accord with facts.

14. The factors to which patients themselves attribute cures are apt to be, like the causes they assign for their troubles, trivial and inadequate.

15. Among medical officers there is a striking general tendency to ignore mental mechanisms; cures are attributed to this or that therapeutic method, every method having its advocates and opponents.

16. According to my experience, the particular method of therapy is a matter of comparatively little importance.

17. In cures the following factors are frequently seen to be operative: (*a*) Medical officers impressing patients in such a way as to preclude any hope of successful imposition, (*b*) demonstration of the unreal nature of the disability, (*c*) strict discipline as opposed to sympathy, coddling, or humoring, (*d*) painful or otherwise disagreeable treatment, (*e*) removal of motive by change of situation.

18. Many spontaneous cures occurred, in previously refractory cases en route to the United States and later on the signing of the armistice.

19. Among circumstances contributing to the prevalence of war hysteria is gullibility of the medical profession.

20. As opposed to laymen, the tendency of medical men is to overlook or ignore underlying motives and mental mechanisms and to allow themselves to be imposed on in the crudest fashion.

21. Military law places medical officers in a difficult position. They must either designate the disability by some respectable name, such as hysteria or psychoneurosis, or make a diagnosis of malingering and have to prove criminal intent.

22. All are agreed as to there being a close similarity in the clinical manifestations of hysteria and malingering and as to there being great difficulty in practice of establishing the differentiation.

23. The motives which I have found to be the mainspring of hysterical conduct are the same as those which students of malingering have reported as actuating their subjects.

24. In the one case of malingering which has come under my own observation the manifestations were typical of hysteria.

25. A search through the literature reveals but one point to which the differentiation is generally fastened; namely, conscious or unconscious quality of the motivation.

26. It is strange that so futile a consideration, one so obviously belonging to the domain of metaphysics and not science, as the question of degree of consciousness of a mental process, should become the preoccupation of scientific men and should be chosen as a criterion of clinical diagnosis!

27. Further phases of confusion of hysteria and malingering.

28. Among other suggested points of differentiation between hysteria and malingering are: (*a*) Result of treatment by persuasion, i. e., if persuasion fails to cure the case is not hysteria but malingering (Babinski). (*b*) A desire to be cured speaks for hysteria; the opposite indicates malingering. (*c*) The malingerer dreads examination; the hysteric welcomes it. (*d*) Hysterical manifestations bear the stamp of a certain genuineness which those of malingering lack.

29. In my experience differentiation based on any of these points is not possible.

30. My own experience and study lead me to the conclusion that what some have described under the name of hysteria and what others have described under the name of malingering are one and the same thing. The difference seems to be entirely one of point of view.

31. War experience has shown that hysterical manifestations can be actuated by motives other than sexual.

32. In most other respects, what I have seen of hysteria in the course of war experience bears out Freud's conception of its underlying mental mechanisms better than any other pre-war conception.

33. The essential feature of the hysterical personality seems to consist in a character defect.

34. I would banish from medical classification such euphemisms as "hysteria," "shell shock," "traumatic neurosis," etc.; and would also banish the expression "malingering" with its implication of crime for which the responsibility is entirely on the patient.

35. I would designate, instead, the cases in question by the term *constitutional psychopathic state, simulation.*

36. The cases classed under the heading of neurasthenia may be roughly divided into two groups. The first represents a condition allied to the manic-depressive psychoses; the second is characterized by vague general hypochondriasis, may often be shown to be motivated exactly in the manner of ordinary hysterical manifestations, and is, to my mind, but a special type of hysteria or simulation.

37. My experience has amply shown that the possession of native intelligence far above the average and good educational and social opportunities are not incompatible with hysterical character defect and with gross lack of moral sentiment.

38. Judging from the narrative of survivors of a torpedoed transport it would seem that nothing that happened in the war was more exhausting, horrifying, depressing and nerve racking than their experience.

39. These cases show what remarkable stability a normal neuropsychic constitution has and how inadequate etiologically, in the absence of a neuropathic predisposition, are the factors to which psychoses and psychoneuroses are so often attributed.

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Abstracts from Current Literature

THE ROLE OF FOCAL INFECTIONS IN THE PSYCHOSES. HENRY A. COTTON, J. Nerv. & Ment. Dis. **49**:177 (March) 1919.

Cotton deserves credit for following the bent of the times and advocating that psychiatrists, too, pay attention to focal infections in cases of insanity, just as one would pay attention to more overt medical situations. No one will take issue with him on this. But he goes much farther than that. One has the feeling all through the paper that to Cotton focal infections are the real cause of his psychoses. To be sure, he says at one point, merely that they play an *important* rôle in the etiology of psychoses, and again that he is willing to give psychogenic factors their etiologic rôle when they exist, but that he does not believe they are essential for the production in all cases. He believes, however, that mental causes do not act in a psychogenic manner but as in tuberculosis, as he says, by merely weakening the patient's resistance toward physical factors. So far, then, he is fairly conservative. On the other hand, however, he also makes the statement that he is "inclined to place heredity and constitution in a minor rôle as determining the individual's reaction to certain toxins, but not determining the psychoses without these extrinsic factors." These are therefore practically flatfooted statements that mental causes do not act psychogenically and that focal infections, or to be quite just to Cotton, "extrinsic" factors, are the real causes in manic-depressive insanity. The reviewer is personally impressed with the importance of psychogenic causes per se, knowing of course full well that they are often difficult to find, especially by a superficial examination, and he would of course not deny the importance to physical factors, because we all have seen manic-depressive attacks following acute diseases. But to Cotton, evidently these are the real causes. One is, of course, open to conviction and therefore it is interesting to see what these claims are based on. He has eleven patients; five of these died. Case 1 was that of a woman who began with delirium after acute articular rheumatism. The delirium was protracted and left her apathetic (hardly a clear manic-depressive case). Finally she died with a streptococcus meningitis. Case 2, after "grip," became, probably, manic. The throat was found inflamed and viridans was discovered in cultures from the throat and the blood was positive for the same organism. She died twelve days later from pneumonia in which viridans was found at the necropsy. Case 3, four weeks after "grip" and pleurisy, became manic. "Physical condition suggested paresis." Bad teeth and cheek infection with streptococcus longus in cultures from cheek, mouth and blood stream were found. After nine days death occurred from endocarditis and general septicemia. Case 4, after ischiorectal abscess, presented a "typical manic reaction," to which delirious features later were added. He died in five days with pus in chest muscles inguinal region, purulent pleuritis, pneumonia, catarrhal enteritis, staphylococcus aureus being found in all abscesses. Case 5 was that of a nurse of peculiar make-up whose sister had trouble about some accusation she made against a man. After some days the sister was found with her wrist cut and the patient "as a raving maniac." On the second day of admission she developed a high temperature, pulse 140, convulsions, was semistuporous, in a "manic delirium," and soon developed jaundice and died. She had sordes and inflamed throat; the fixation test for streptococcus was positive. At the necropsy the

Connellan-King gram-negative diplococcus (designated by Cotton C-K diplococcus) was found extensively. The diagnosis of manic-depressive insanity may fairly be questioned, and as regards all of these cases it must be admitted that for the theory of manic-depressive insanity in general they prove nothing.

Case 6 was that of a man who in the previous year had had a depression. The attack under question was evidently a hypomanic state. During the attack teeth infection was discovered with the Connellan-King organism which was also found in the urine. After the extraction of the teeth he calmed down and developed a mild depression. Case 7 was that of a man who had had repeated exhilarations followed by another hypomanic attack in which a "highly acid stool" with Connellan-King diplococcus was found. Alkaline rectal injections and rest were prescribed for him. Under the treatment the hypomanic symptoms disappeared; but here again the condition was soon followed by a depression. It is, of course, not clear why, if these manic attacks are regarded as due to infection, the depression should occur after the infection is treated. Moreover, Cotton's statement that since these two cases were so similar one should expect similar infection (as was actually the case) again shows how close he regards the relationship between infection and the clinical picture—evidently to the extent of intensity and symptom picture. It must be added that Cotton himself seems a little doubtful regarding the convincing nature of these two cases, as he also seems to be about the next, that of a woman who developed a manic attack after pneumonia, and two weeks after a lumbar puncture recovered. Indeed he seems to have the same misgivings about Case 9, a woman who during a depression made a suicidal attempt (throwing herself from a bridge), after which she was confused and agitated. Since she showed evidence of intestinal intoxication and a streptococcus of the viridans variety was isolated from the stools "in much larger quantity than normally," she was given colonic irrigations. After this was done "for some time" she recovered, five months after admission. Curiously enough he seems to feel no doubt about the next patient (Case 10), a man with a long depression in whom fixation for viridans was positive in blood and fluid and whose teeth were infected. Although the latter were extracted, he did not improve. Vaccine from viridans was given, but he did not recover from the depression until months later. Case 11 is that of a woman who had had repeated depressions and one manic attack. With her psychosis were usually associated headaches and gastro-intestinal symptoms. In another hospital she was manic, depressed, stuporous and again delirious. Under observation she seems to have had a prolonged stupor. After six years she gradually recovered after extraction of one infected tooth.

The reviewer has purposely refrained from expressing an opinion about the bacteriologic side of the paper, as he feels hardly competent to do so. He thinks the cases have been fairly summarized. For Cotton's therapeutic endeavors they speak well, and as such are worth reporting, but they certainly do not justify the rather sweeping attitude which he assumes in regard to the theory of manic-depressive insanity in general.

HOCH, Montecito, Calif.

APHASIA AND ASSOCIATED SPEECH PROBLEMS. MICHAEL OSNATO, M.D., Neurol. Bull. **1**:407, 1918; **2**:19, 1919.

In this somewhat extended article the author endeavors to cover the whole field of his subject in rather an informal manner. He admits that he has little that is new to offer and he confines himself to a thorough review of

the literature interspersed with reports of cases of his own to prove or disprove the contention of the various authors. His arguments are based mainly on the didactic clinical grounds, for in but few cases has he pathologic evidence of the causative lesion.

The article starts with a complete and interesting review of Villiger's conception of speech development, but he doubts the truth of Villiger's contention that the development of intelligence and of speech are entirely independent. In fact, the author's main contention is that the two are inseparable.

Wernicke's idea of aphasia in its various types are reviewed, with little sympathy, and the author closes his first chapter with a reference to the speech defects other than aphasia, i. e., stuttering, stammering, agramatism, hearing mutism, congenital word blindness and deaf mutism.

In the second chapter the author proceeds with the development of his own ideas and those of others. He shows much sympathy with Head's review of Jackson's work and Marie's conception, except that of the much debated "lenticular region." He lays considerable stress on Burckhardt's operations of removal of speech center which resulted in no aphasia and in this connection he reports his first case—one in which a large part of the left temporal lobe sloughed away, following an exploratory operation. After one week this patient showed some paraphasia which the author considers to have been due to pain, fatigue and exhaustion rather than to the organic brain defect. Three months later the patient showed no aphasia. In reporting this case, the author outlines his method of studying his material, which consists of the fifteen questions proposed by Tilney.

The author now considers the question of apraxia, and quotes the opinions of Marie, Von Monakow and Grasset as evidence for his belief that both apraxia and aphasia are defects of the intelligence. In this contention he reports three cases with aphasia and intelligence defects with and without paralysis. In a fourth case aphasia and apraxia both existed with intelligence defects. There appear to be little grounds for believing in a local lesion as the cause of apraxia and the author maintains that "the whole cortex is indivisibly associated with the development of the function of specialized purposeful movement and its performance." In reviewing Kennedy's ideas of "stock brainedness" the author takes exception to his conclusions and reports two cases to disprove the contentions of the former.

In mentioning the work of James and MacDougal, the author takes issue with their idea that a kinesthetic idea must necessarily precede all voluntary motion, and in this contention, instances cases of children who suddenly walked a considerable distance without previously having tried to walk.

Speech, the author concludes, is a part of intelligence, for aphasia and apraxia are inseparable from other disorders of intelligence. The entire brain participates in the mechanism of speech, even the cerebellum. In considering the speech symptoms of dementia praecox, the author reviews Southard's work on the glioses in this disease and the similar work of Lambert in presenile psychosis, in both of which conditions the lesions are very diffuse.

In Chapter 7 the author considers elements in speech other than the use of words, i. e., tone and gesture which may convey a meaning quite opposite to that of the spoken word. These must be considered as integral parts of speech. No part of the brain or group of centers can be said to control speech, although the control of the motor part of speech may be localized in the area which controls the movements of the vocal cords and phonation.

In a final chapter the author catalogues other forms of speech difficulty existing in organic diseases—the "hot potato speech" of Friedreich's ataxia, the monotonous, colorless speech of cerebro-cerebellar ataxia, paralysis agitans and Wilson's disease, the scanning speech of multiple sclerosis and the slovenly, inadequate speech of the tabetic. The speech of paralysis agitans, Wilson's disease and multiple sclerosis, the author considers to be due to a disturbance of the cerebellar mechanisms. After a review of the anatomy of these mechanisms, he concludes that the cerebellum coordinates and gives tone to speech as well as to any other motor phenomenon.

The author has given us an interesting and valuable contribution to the study of speech and its disturbances. His method of handling his material is rather original, and he makes the most of what he has. One could wish that he had more material, especially postmortem material which would have given additional conviction to his arguments. From his last paragraph one judges that the author feels that he has not proved his contentions as well as he would wish to or to the extent to which he believes them.

CASAMAJOR, New York.

CONTRIBUTION TO THE STUDY OF LUETIC-EPILEPSY. DIETZ L. EDZARD, Deutsch. Ztschr. f. Nervenh. **63**: Nos. 5 and 6.

Epileptic manifestations following syphilitic infection present no particular difficulty when they are accompanied by indications which point to a syphilitic involvement of the brain or meninges. In those cases, however, in which a person infected with syphilis develops epilepsy without showing any specific syphilitic changes in the central nervous system, the problems of differentiation are more difficult and opinions more divergent.

Edzard presents in detail the study of the history of a man, 35 years of age; an artist of neuropathic heredity, who was subject to occasional epileptic attacks at infrequent intervals and who showed no evidence of mental deterioration. Alcoholic excesses and the hardships of a severe campaign as a soldier had no aggravating effect on the epilepsy. But in 1916 the patient contracted syphilis and within eighteen months he received three courses of intensive antisyphilitic treatment. Subsequent to the third course there was an increase in the epileptic attacks, which culminated in a status epilepticus. After subsidence of this condition marked mental deterioration manifested itself. Three months later a second status epilepticus developed, which was followed by mental hebetude, circumstantiality, irritability and disturbance of speech of a permanent character. The neurologic symptoms were transitory and the spinal fluid, except for a slight lymphocytosis detected in one examination, showed no deviation from the normal. The blood Wassermann test was at first negative, then it varied and finally became positive and remained so despite carefully exhibited treatment.

What bearing the syphilis had on the course of the epilepsy, and the explanation of the serologic findings, or rather, their paucity, is the problem Edard discusses. He holds that the status epilepticus may account for the transitory lymphocytosis, but that in general there is no characteristic picture to be had in the spinal fluid in epilepsy.

Observations made on syphilitic persons without any history or indication of epilepsy, who after the infection develop epilepsy, seem to indicate that the epilepsy is of the symptomatic type. Redlich, on the other hand, explains the manifestations as organic but based on minute histologic manifestations.

Others hold that there is a toxicodynamic cause similar to that found in the parasyphilitic epilepsy of Fournier; Nonne speaks of a postsyphilitic epilepsy following late on syphilis, in which there is an increase and a stimulation of a latent epileptic disposition through the acquired syphilis.

In the present case the acute exacerbation and the progress of the epileptic symptoms may be ascribed to the toxic dynamic effect of syphilis. As is well known, recent studies have shown that in secondary syphilis there is frequently pronounced involvement of the nervous system. The connection, in the present instance, between the increase in the epileptic symptoms and the vigorous antisyphilitic treatment must not be overlooked, and carries with it the suggestion that in the treatment of syphilis occurring in persons of the neuropathologic type great caution must be exercised and the application of a routine method avoided. In other words, there should be a greater individualization of therapy in syphilis of a neuropathologic type.

GOTTBRATH, San Francisco.

REEDUCATIONAL TREATMENT IN APHASIA. F. REICHMANN U. ED. REICHAU, Archiv. f. Psychiat. **60**:8, 1919.

The optic-tactile method of reeducational treatment in aphasia is favored by these authors in both motor and sensory forms. The traumatic brain injuries of war, producing aphasia in otherwise normal brains, have afforded particularly desirable material for this study. They lay particular stress on the development of kinesthetic memory pictures to replace the usual auditory memory pictures, and claim to have achieved satisfactory results. A number of case histories are presented that give the technic of their method, which is in brief: The patient is shown the motor mechanism of the mouth, lips, etc., for each separate sound. His hand is placed over the larynx and then over the mouth and nose, in order to perceive the air vibrations. Then, by the aid of a mirror, under guidance of the instructor, the patient practices the formation of each vowel and consonant sound. The kinesthetic impressions of sound are thus formed later into syllables, words and sentences. A chapter is devoted to a discussion of the central nervous mechanisms concerned in recovery of speech. The practical experiences of the authors incline them to the view of a vicarious action of the right hemisphere. This view is supported by the clinical fact that patients who have learned to write with the left hand because of the paresis of the right, still favor the left hand after the paralysis on the right hand has cleared. Writing exercises with the left hand are said to influence favorably speech reeducation.

SCHALLER, San Francisco.

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HUGH T. PATRICK, M.D., *in the Chair*

TRANSPLANTATION OF PERIPHERAL NERVES. Presented by PROF. G. CARL HUBER, Ann Arbor, Mich.

The data to be presented have been gathered in the course of experimental work carried on in conjunction with the Division of Head Surgery of the Office of the Surgeon-General and extend over a period of somewhat more than one year. During this period Lieut.-Col. Dean D. Lewis, Majors J. F. Corbett and Byron Stookey, and Capt. T. Roberg have in succession received assignment to the department of anatomy, University of Michigan, where this work has been carried on. To their initiative and untiring and hearty cooperation, the progress of the work and the results attained owe much.

In the prosecution of the experimental operative work strict asepsis was followed. So far as possible, the surgical technic was that of modern aseptic surgery. In practically all of the experimental operations union was by primary intention.

Owing to the difficulty of obtaining catgut sutures of suitable size and quality for uniting resected nerves, we were early in our work led to adopt a silk suture and as technic developed, Triple 0, Corticelli silk thread, unraveled so as to obtain three fine threads, became the standard suture in nerve repair. Before use, the sterilized threads were thoroughly waxed with sterile wax; this facilitating greatly the application of the suture. In practically all of our experiments of nerve transplantation the silk suture was passed through the nerve trunk and nerve transplant. The passing of a silk suture through a nerve trunk and transplant is innocuous, the silk suture becoming early encapsulated in a thin layer of connective tissue which does not materially interfere with the downgrowth of central neuraxes.

The tissues obtained from the animals operated on have for the greater part been stained after the pyridin-silver method, and for many of the experiments were sectioned at close intervals, in cross and longitudinal sections, for the length of the nerve operated on. This method gives a differential staining for the neuraxes, especially desirable in a study of the regenerative processes of peripheral nerves.

Regarding nerve regeneration, we maintain that regeneration of a degenerated portion of a peripheral nerve is through downgrowth of new neuraxes derived from the central nondegenerated portion of said nerve, the peripheral degenerated portion taking no immediate part in the regeneration of the neuraxes.

In the earlier stages of this experimental work, and in association with Lieut.-Col. Dean D. Lewis, the question of injecting absolute alcohol into a living nerve, and related problems, was dealt with in four series of experimental observations. Though not coming immediately within the scope of

the question under consideration, they have a bearing on certain of the experiments to be considered. In one of these series the use of absolute alcohol to obviate the formation of amputation neuroma was tested.

Series No. 1.—Sciatic of Rabbits.—Thirty-three experiments; respective animals under observation for periods varying from two to 157 days. The sciatic of rabbits was exposed and injected in about the middle of the leg with about 0.5 c.c. of absolute alcohol, in two or three point injections. The sciatic was then cut from 3 to 5 mm. distal to the point of injection and from 1 to 1.5 cm. of the distal sciatic stump resected. The wound was then closed. The operated animals were killed at intervals and it was observed that this simple procedure obviated the formation of amputation neuroma.

Series No. 2, a Control Series.—In this series it was ascertained that amputation neuromas form after every section of a peripheral nerve, even though the section be made under strict asepsis, with immediate closure of the wound and with wound healing by primary intention. In central nerve stumps injected with absolute alcohol, exposed and examined at stated intervals, it was noted that such central stumps terminate in a fine tapering end with no appreciable enlargement. From four to five weeks after section and alcohol injection, fine, newly formed neuraxes penetrate these tapering ends and may even grow beyond, but these down-growing neuraxes do not present the tangle and excessive proliferation of new nerve fibers noted in an amputation neuroma and there is primarily no proliferation of sheath cells. For use in human surgery it is recommended that from 1 to 2 c.c. of absolute alcohol be injected into the distal end of the nerve stump, from 1 to 2 cm. central to the cut end of the nerve. It is suggested, especially for the larger nerves, that a series of point injections be made, perhaps in two or three tiers, so that all parts of the nerve be reached with absolute alcohol. This method can be recommended as a simple and efficient method for preventing the formation of amputation neuroma.

Series Nos. 3 and 4.—In a further series the behavior of a living nerve injected in course with absolute alcohol or acetone, and without cutting the nerve, was experimentally studied. The injection of absolute alcohol into a living nerve causes fragmentation of neuraxes and myelin in the field coming under the immediate influence of the absolute alcohol. This fragmentation differs from that of Wallerian degeneration and is not accompanied by a primary proliferation of sheath cells. In due time, regeneration by the down-growth of central neuraxes follows. In cases of severe causalgia, in which section of the nerve is contemplated, injection of absolute alcohol without nerve section should be considered.

The great majority of our experiments have dealt with the question of bridging nerve defects of such extent that the severed nerve ends, after the necessary repair and resection, cannot be brought end to end, without undue tension, by process of simple suture. In this connection the question more immediately under discussion, namely, nerve transplantation, received especial consideration. In the series of experiments listed, the following nomenclature is used: A segment of nerve used to bridge a defect in a peripheral nerve, taken from another nerve of the same individual, is designated an ***auto-nerve-transplant;*** a segment of nerve taken from another individual, but of the same species, is designated a ***homo-nerve-transplant;*** a segment of nerve taken from another individual and of a different species is designated a ***hetero-nerve-transplant.*** Collateral questions, such as the use of certain membranous structures for purposes of sheathing a nerve-transplant and suture lines; the

question of the use of tubular sutures in nerve repair and of nerve suture under undue tension, subjected to experimental test, are not reported on at this time.

Experimental observations warrant the conclusion that bridging nerve defects by means of nerve transplants is a legitimate operation and one to be recommended in cases where there is loss of nerve substance of such extent that ordinary suture cannot be made without undue tension.

The experimental observations dealing with nerve transplantation and related questions are here considered under the following series:

Series No. 5. Auto-Nerve-Transplants.—Sciatic of dogs. Seventeen experiments, with respective animals under observation for periods varying from eleven to 382 days.

In these experiments the sciatic nerve was exposed and resected to the extent of from 2.5 to 3 cm. The resultant defect was bridged by means of a segment or several segments of nerve taken from one of the sensory cutaneous branches of the same dog. In our experiments the transplant was taken from the cutaneous radial branch. Since in surgical practice in dealing with the repair of the larger nerves, the resection of a normal nerve of approximately the same size for purposes of obtaining an auto-nerve-transplant is not justified, it has been the procedure to use for an auto-nerve-transplant a segment of one of the cutaneous nerves of much smaller size than the nerve to be bridged. The resultant difference in the size of the nerve to be bridged and the transplant has mitigated against obtaining optimum results. It occurred to us that this difference in size of transplant and nerve to be bridged might in a measure be overcome by making use of several segments of a smaller nerve to bridge a defect in a larger nerve. This procedure we designate a cable-auto-nerve-transplant. In eight experiments out of the seventeen of this series this method was tested by taking four segments of the cutaneous radial nerves to bridge a defect in the sciatic. These segments were sutured separately or in groups of two, both centrally and distally, between the resected ends of the sciatic. In the remaining nine experiments of this series the defect in the resected sciatic was bridged by using, respectively, one segment of the cutaneous radial, five experiments; two segments, three experiments; three segments, one experiment.

The observations made on these experiments may be summarized by stating that the "cable auto-nerve-transplant" presents a method for bridging nerve defects which gives every promise of favorable results. Within a few days after the operation the several segments of nerve transplanted become surrounded by connective tissue, so as to form an epineural sheath, binding them together in one nerve trunk in which the funicular arrangement of the several nerve segments transplanted is fully maintained. Downgrowing neuraxes coming from the central stump penetrate and pass through the several funiculi to reach the distal segment which in time becomes penetrated by new neuraxes. These experiments have been carried on for a time of sufficient length to obtain new motor nerve endings in the calf and plantar muscles and evidence of sensory regeneration. It is admitted that this operation is tedious, requires care and some skill and necessitates the making of a second wound. However, the experimental results justify its recommendation. In surgical practice the cutaneous radial and the cutaneous portion of the musculo-cutaneous of the arm, the lesser sciatic, and especially the sural of the leg may at convenience be selected as the nerves from which segments for a cable auto-nerve-transplant may be taken.

Series No. 6. Homo-Nerve-Transplants.—Sciatic of rabbits: seven experiments, with respective animals under observation for periods varying from eight to eighty-three days.

In these experiments a segment from the sciatic of one rabbit was used to bridge a defect in the sciatic of another rabbit experimentally resected. These experiments show that a fresh homo-nerve-transplant may be employed to bridge a nerve defect with every promise of success. Since chance alone would permit this operation in surgical practice other experiments dealing with homo-nerve-transplants were devised and will be considered in this report.

Series No. 7. Hetero-Nerve-Transplants.—Sciatic of rabbits: thirty-nine experiments. In sixteen of these the two sciatics of half grown guinea-pigs were used to bridge a defect in the sciatic of grown rabbits; in twenty experiments one of the sciatics of a full grown guinea-pig was used to bridge a defect in the sciatic of a full grown rabbit; in three experiments one of the major nerves of a dog was transplanted to a sciatic of a rabbit. The respective animals were under observation for periods varying from three to over 300 days.

The question of the possibility of using hetero-nerve-transplants is of academic and practical interest. The ease with which fresh, normal nerves may be obtained as hetero-nerve-transplants warrants the interest taken by surgeons in experiments dealing with hetero-nerve-transplants. Opinions current in literature are not unanimous as concerns experimental observations on hetero-nerve-transplantation. Our own results may be summarized in this brief abstract in the statement that neurotization of the distal stump through a hetero-nerve-transplant is experimentally possible. However, the results obtainable are not as certain and not as favorable as when auto-nerve-transplants or homo-nerve-transplants are used, and the resultant distal regeneration not as complete. Therefore, this procedure cannot be recommended as an operation of choice in surgical practice.

The following series of experiments deals with the use of degenerated auto-nerve-transplants, homo-nerve-transplants and hetero-nerve-transplants. Every nerve transplanted undergoes degeneration. Whether nerves degenerated before transplantation would prove more favorable for downgrowth of central neuraxes than nerve transplants taken from fresh, normal nerves which would undergo degeneration after transplantation, seemed worthy of experimental test.

Series No. 8. Degenerated Auto-Nerve-Transplants.—Sciatic of dogs: three experiments; respective animals under observation for periods varying from 127 to 416 days.

In this series of experiments the sciatic nerve was cut and the wound closed. About twenty days later the cut sciatic was again exposed and a segment of the degenerated distal stump transplanted to the resected ulnar of the same dog. The experiments of this series are too few to warrant drawing definite conclusions. The statement seems justified that regeneration of the distal stump of a resected nerve through a degenerated auto-nerve-transplant is possible, but that such regeneration is not more favorable nor more rapid than when a nondegenerated auto-nerve-transplant is used.

Series No. 9. Degenerated Homo-Nerve-Transplants.—Sciatic of dogs: five experiments; respective animals under observation for periods varying from seventeen to 328 days.

For this series the sciatic nerve of a number of dogs was cut and the wound closed. Some twenty to thirty days later the cut sciatic was again exposed and a segment taken from the degenerated distal stump and transplanted to bridge

a defect in a resected sciatic of another dog. The observations made on these experiments warrant the general conclusion that regeneration of the distal stump of a resected nerve may be obtained through a degenerated homo-nerve-transplant. The possibility of using a degenerated nerve as a homo-nerve-transplant in surgical practice is warranted by these observations.

Series No. 10. Degenerated Hetero-Nerve-Transplants.—Sciatic of rabbits: eighteen experiments; respective animals under observation for periods varying from three to 244 days.

For these experiments one of the major peripheral nerves of a dog was cut and allowed to degenerate for periods varying in the respective experiments from about twenty to thirty days. A segment of the degenerated nerve was then transplanted to the resected sciatic of a rabbit. The syncytial, nucleated strands found within the sheaths of degenerated peripheral nerves, having undergone Wallerian degeneration, may be regarded as simulating embryonic tissue. Such tissue, it was argued, should prove more favorable for downgrowth of central neuraxes than would be the nondegenerated nerve fibers of a hetero-nerve-transplant. The observations made on this series of experiments do not bear out this assumption. It was observed that the degenerated hetero-nerve-transplant undergoes a secondary degeneration. In certain of the experiments downgrowth of the central neuraxes through and on the degenerated hetero-nerve-transplant was obtained. However, the results, even in the experimental observations, were so uncertain that the adoption of this procedure in surgical practice is not warranted.

The following series of experiments was devised to test the possibility of storing homo-nerve-transplants for a period of several weeks before use. The possibility of obtaining human nerves under aseptic precaution, from amputated limbs, and storing them until operative procedure demands their use, would obviate the difficulty experienced in surgical practice of obtaining fresh human nerves on demand.

Series No. 11. Homo-Nerve Transplants Stored in Petrolatum.—Sciatic of rabbits: eight experiments; respective animals under observation for periods varying from sixty-six to 155 days.

Dujarier and Francois (*Bull. et mém. Soc. de chir. de Par.* **44**:: January, 1918), in a series of twenty-four cases reported the use of homo-nerve-transplants stored in petrolatum before use in operative procedure. They recommend that the nerves be removed from amputation stumps under aseptic precautions, and placed at once in warmed, sterile petrolatum and then kept at nearly 0 C. temperature. Nerves were thus kept for several weeks. Before use, the petrolatum was again warmed, the nerve removed and washed in warm sterile serum. Twenty-four cases were operated on and reported before sufficient time had elapsed to enable determining the ultimate results. It is reported that in all cases but one the healing of the wound was by primary intention.

At the time our experiments were undertaken we were unable to find any experimental observations on this method. In our experiments the method suggested by the French observers was followed as closely as the brief account descriptive of the method permitted. The sciatics of full grown rabbits were removed under asepsis, placed at once in sterile petrolatum contained in tubes warmed to the melting point of the petrolatum. The tubes were then placed in a small ice chest kept at constant temperature of 3 C. In the several experiments, after periods varying from four to thirteen days, the nerves thus treated were used to bridge defects of about 3 cm. lengths, caused

by resection of the sciatics of rabbits. The results of these experiments are gratifying. Functional return was noted in the experiments of longer duration. Time has not permitted a histologic study of the tissue removed. In the experiments of shorter duration a microscopic study of the transplant shows abundant down growth of central neuraxes through the transplant. The experimental observations warrant the statement that this method, as suggested by the French observers, deserves consideration in surgical practice.

Series No. 12. Homo-Nerve-Transplants Stored in Liquid Petrolatum.—Sciatic of rabbits: forty experiments; respective animals under observation for periods varying from one hour to 229 days. (To date, certain of the animals are still under observation.)

Under the method of storing nerves in petrolatum (Series No. 11) it is necessary to warm the petrolatum to the melting point before the nerve segment can be placed therein, likewise when the nerve segments are removed therefrom. To obtain sterile serum is not always easy. For these reasons we have devised a simple method which consists in storing nerves in liquid petrolatum. We have used Squibb's liquid petrolatum. This is a clear, bland fluid. The required quantity was placed in large tube-vials, corked with cotton plugs, then autoclaved on successive days. After cooling to room temperature, the tubes with liquid petrolatum were placed in the ice chest and cooled to 3 C. The sciatics of full-grown rabbits were removed with asepsis, placed in the cooled and sterile liquid petrolatum and kept at 3 C. Nerve segments thus stored in liquid petrolatum were used in the several experiments after storage of from four to thirty-nine days, as nerve transplants to bridge defects of approximately 3 cm. length in the sciatic of rabbits. For each experiment the tube containing the nerve transplant was taken from the ice chest just before the operation, and when required, the nerve transplant was taken from the liquid petrolatum, and this allowed to drain off by holding the nerve segment suspended from one end by means of forceps. Sutures were then placed near each end of the nerve segment and the ends cut by means of sharp scissors to within about 2 mm. of the sutures. The nerve segment was then sutured to the two ends of the resected sciatic. Nerves stored in this manner even for a period of thirty-nine days, retain their color and consistency remarkably well. The experimental animals of this series of longer duration, six months and over, have not as yet been killed and examined. The experiments completed and fully studied warrant the conclusion that neuraxes derived from the central end will grow through a homo-nerve-transplant, having a length of 3.5 cm., and stored in liquid petrolatum for a period of somewhat over five weeks, quite as well as through a freshly removed homo-nerve-transplant. Very satisfactory neurotization of the degenerated distal segment has been obtained through a homo-nerve-transplant stored in liquid petrolatum, having a length of somewhat over 3 cm., 100 days after the operation. Experimental observations warrant the statement that the use of human nerves obtained from amputated members and stored in liquid petrolatum as here directed, for the purpose of bridging nerve defects, deserves serious consideration as a surgical procedure.

Series No. 13. Homo-Nerve-Transplants Stored in Sterile 50 Per Cent. Alcohol.—Sciatic of rabbits: eighteen experiments, with respective animals under observation for periods varying from two to 151 days. (Certain animals of this series are still under observation.)

Nageotte (*Bull. et mém. Soc. de chir. de Par.* **44**: 1918) has recommended the use of nerve transplants stored in 50 per cent. alcohol. For this series

the sciatics of full-grown rabbits were removed under asepsis and placed at once in 50 per cent. alcohol contained in wide-mouthed glass-stoppered bottles. In the 50 per cent. alcohol the nerve segments were stored for periods varying in the several experiments from seven to twenty-nine days. Just before use as a nerve transplant the nerve segment was taken from the 50 per cent. alcohol and placed in a dish containing sterile normal salt solution in which they remained from fifteen to twenty minutes. When taken from the 50 per cent. alcohol the nerve segments are quite hard, though not brittle. After a short stay in the normal salt solution they again become quite pliable. The nerve segments were taken from the normal salt, sutures placed, the ends freshened by cutting with sharp scissors about 2 mm. from the suture lines and the operation completed by transplanting the nerve segment into a defect caused by resection of the sciatic of a rabbit. Time has not permitted conclusive observations on this series. The observations made thus far indicate clearly that downgrowing neuraxes coming from the central stump penetrate readily a homo-nerve-transplant having a length of 3 cm. and stored in 50 per cent. alcohol for nearly four weeks, and thus guide the downgrowing neuraxes to the degenerated distal stump.

In this series of experiments of homo-nerve-transplants stored in petrolatum, liquid petrolatum, or 50 per cent. alcohol, the observations indicate that the nerve segments thus stored do not retain a latent viability. The sheath cells of the transplants show no evidence of proliferation and appear not to have a biologic significance. The neurolemma sheaths of the transplanted nerve fibers are well preserved and through these the downgrowing neuraxes of the central stump find ready paths and thus reach the distal stump. Therefore, it seemed desirable to test the behavior and the value of hetero-nerve-transplants stored in liquid petrolatum and 50 per cent. alcohol and for this purpose the following series of experiments were undertaken.

Series No. 14. Hetero-Nerve-Transplants Stored in Liquid Petrolatum.—Sciatic of rabbits: six experiments, respective animals under observation for periods varying from five to 117 days. (Certain of the animals of this series are still under observation.)

For this series certain of the major nerves removed from dogs under strict asepsis were stored in liquid petrolatum, as described under series No. 12, for periods varying from eleven to twenty-five days, and then used as nerve transplants to bridge defects in the sciatic of rabbits caused by resection. None of the longer time experiments of this series have thus far been studied histologically. Therefore, no conclusions as to the value of this method can at the present time be drawn.

Series No. 15. Hetero-Nerve-Transplants Stored in 50 Per Cent. Alcohol.—Sciatic of rabbits: three experiments, respective animals under observation for periods varying from sixty-four to 117 days. (Two of the animals are still under observation.)

For this series certain of the major nerves of dogs were removed and stored in 50 per cent. alcohol as described in Series No. 13. They were then used to bridge defects in the sciatic of rabbits. Two of the animals of this series are still under observation; the other experiment was terminated by death of the animal too soon after operation to admit of drawing definite conclusions.

References are frequently made in surgical literature to the use of certain membranous structures employed as sheaths which are wrapped about nerve transplants or suture lines. Concerning the necessity or value of such sheaths

there is no unanimity of opinion. The following series of experiments was undertaken to test their value. It should be stated that it is here recognized that the clean, surgically aseptic, operative wounds in animal experiments, made through normal tissue, do not simulate the operative wounds in surgical practice in many cases of secondary nerve suture, made in the presence of abundance of cicatricial tissue. However, it was hoped that certain general principles might be ascertained to serve as guides in surgical practice.

Series No. 16. Auto-Nerve-Transplant with Nerve Transplant and the Suture Lines Wrapped in Several Layers of Cargile Membrane.—Sciatic of dogs, thirteen experiments, with respective animals under observation for periods varying from twenty hours to 359 days.

In these experiments we made use of Cargile membrane prepared by Johnson & Johnson. The left sciatic and the right ulnar nerves of respective dogs were exposed and a segment of the right ulnar from 3 to 4 cm. long was transplanted to bridge a defect in the sciatic, caused by resection. After suturing the transplanted ulnar, the transplant and the sutures were surrounded by two or three layers of Cargile membrane, closely applied and wrapped about the nerve. The wound was then closed. Untreated Cargile membrane, as here used, it was found, was absorbed within a period of ten days; that is to say, before it could serve a purpose in preventing connective tissue formation in the immediate vicinity of the transplant and suture lines. Therefore, its value in surgical practice is seriously questioned.

The difficulty of obtaining Cargile membrane at the time these experiments were made led us to attempt resterilization of that portion of each membrane not used at any one operation. This was accomplished by placing the same in 70 per cent. alcohol in which they were stored, often for days. Before their use they were placed several hours in absolute alcohol and before use in operations taken from the absolute alcohol, spread out on dry sterile towels and allowed to dry. In five of the thirteen experiments of this series such alcoholized Cargile membranes were used to wrap the nerve transplant. It was found that this very simple method very materially alters the absorbability of the Cargile membrane as found in the market. In one experiment terminated nearly five months after the operation distinct evidence of the Cargile membrane was found. In another experiment terminated nearly seven weeks after the operation the alcoholized Cargile membrane was found to have been practically unaltered and remained closely wrapped about the nerve. There was evident no material increase of connective tissue about the alcoholized Cargile membrane thus used as a sheath.

The use of alcoholized Cargile membrane, prepared as above stated in double or triple layers, as a sheath for wrapping nerve transplant or suture lines after nerve suture, when such sheathing is deemed necessary, deserves consideration in surgical practice.

Series No. 17. Auto-Nerve-Transplant Wrapped in Auto-Fascial Sheath.—Sciatic of dogs, fifteen experiments, with respective animals under observation for periods varying from fourteen to 324 days.

In this series of experiments the left sciatic and right ulnar, or vice versa were exposed and a segment of the ulnar transplanted to the sciatic. After suturing the transplant in place this was wrapped in a piece of fascia recently taken from the same dog. The fascial membrane taken was removed and trimmed to such size that when applied it extended about 8 mm. beyond the central and distal suture lines of the transplant, and when wrapped about the nerve formed a closely fitting tube with edges overlapping about 5 mm.

Fine silk stay sutures and several half mattress sutures were placed to hold the sheath in position and complete the tube. The experiments of this series admit the general conclusion that an auto-fascial sheath is very slowly absorbed, evidence of its persistence having been observed three months after operation. However, even in the aseptic wounds made in normal tissue, where use could be made of the fascial planes for exposing the nerves, there is observed a distinct connective tissue proliferation about the fascial sheath, to such extent as to prejudice against this procedure in surgical practice, especially in operations where nerve repair is made through and in cicatricial tissue.

Series No. 18. Auto-Nerve-Transplant with Nerve Wrapped in a Formalinized Arterial Sheath.—Sciatic of dogs, eight experiments, with respective animals under observation for periods varying from six to 241 days.

In this series of experiments the left sciatic and right ulnar, or vice versa, were exposed and a segment of the ulnar transplanted to bridge a defect in the resected sciatic. After the transplant was sutured in place, this was surrounded by a sheath prepared from the wall of a formalinized artery. The carotid arteries of large dogs were removed and stretched over glass rods of suitable size. They were then fixed in 5 per cent. liquor formaldehydi for forty-eight hours; washed in water twenty-four hours; boiled in distilled water for twenty minutes; then stored in 70 per cent. alcohol in sterile, wide-mouthed, glass-stoppered bottles for from several days to several weeks, as necessity demanded. Before use, a segment of the fixed artery of required length was slipped from the glass rod, cut longitudinally along one side and placed in sterile normal salt solution for about thirty minutes. The arterial sheath thus prepared was then wrapped about the nerve transplant and allowed to extend over the suture lines about 5 mm. and fixed in place by central and distal stay sutures and several half mattress sutures, using fine silk. The experiments of this series admit of drawing the following general conclusion: that a formalinized arterial sheath, prepared as above stated, remains in place and without absorption for several months, and this without inciting material increase of connective tissue. It is more particularly the elastic tissue of the vessel wall that resists absorption. Since formalinized arterial sheaths are easily prepared and may be kept on hand in sterile condition in 70 per cent. alcohol, and are easily applied, this method deserves consideration in surgical practice, when sheathing of a transplant or suture line in nerve repair is deemed desirable.

Series No. 19. Auto-Nerve-Transplant with Completely Detached Auto-Fat Sheath.—Sciatic of dogs, two experiments; animals under observation, one, four days; the other, 324 days.

In this series the left sciatic and right ulnar were exposed and a segment of the ulnar transplanted to the sciatic. The nerve transplanted and the suture lines were then wrapped in a membrane of subcutaneous fat, taken from the same animal to one side of the sciatic wound. After removing the membrane of fat, which had an average thickness of about 5 mm., this was gently washed in sterile normal salt solution, so as to remove as far as possible the adherent blood, and was then wrapped about the nerve transplant and suture lines. The sheath was held in place by the use of several fine silk stay sutures. One of these experiments was terminated by the death of the animal four days after operation; in the other, the animal was killed 324 days after operation. In the latter experiment, regeneration of the distal segment was obtained. However, the region of the transplant was surrounded by a distinct layer of dense fibrous tissue occupying the region of the fat sheath and binding the trans-

plant to the subcutaneous tissue. Definite conclusions based on this single experiment hardly seem warranted. However, the result obtained argues against the use of a complete detached fat sheath, even when this is taken from the same animal, since the fat membrane is replaced by dense fibrous tissue.

Series No. 20. Tubular Suture by Use of Formalinized Artery.—Ulnar nerve of dogs, twelve experiments, respective animals under observation for periods varying from four to 298 days.

In this series we made use of the resected ulnars of certain of the experiments in Series Nos. 16 to 19, to test experimentally the value of an arterial tubular suture as recommended by Foramitti and since used in the Russo-Japanese war by Hashimoto. The formalinized arterial tubes were prepared as stated under Series No. 18, essentially as described by Foramitti. Before use, the formalinized carotid artery of a large dog was taken from the glass rod and a segment about 1 cm. longer than the defect in the nerve to be repaired was removed and placed for about one-half hour in sterile normal salt solution. A fine silk suture armed with a fine needle at each end was then passed through the central and distal stump of the resected ulnar, about from 2 to 3 mm. from the cut ends. The needles of each suture were then passed through the opposing sides of the formalinized arterial tube from 7 to 8 mm. from the respective ends of the tube and the ends of the resected nerve, central and distal, drawn into the lumen of the arterial tube and held in place by knotting the silk sutures over one side of the arterial tube. The wound was then closed by using the necessary fascial and skin sutures. In this series of experiments no nerve-transplant was inserted, the ends of the resected ulnar, from 4 to 5 cm. apart, were merely inserted into the ends of the arterial tube and kept in place by means of stay sutures.

In this series, as stated for series No. 18, it was found that the formalinized artery resists absorption for a period of at least three months. In certain of these experiments it was evident that one or the other of the ends of the nerve had been pulled out of the lumen of the arterial tube some time soon after the completion of the operation. In two of the experiments of more than three months' duration neurotization of the distal ulnar was obtained through downgrowing neuraxes of the central stump, conveyed to the distal stump through the lumen of the formalinized artery. This series confirms the possibility of obtaining regeneration of the distal degenerated end of a nerve, after loss of from 4 to 5 cm., through a tubular suture in case the tubular suture resists absorption for a period of sufficient length to admit of downgrowth of the central neuraxes to the extent of reaching the central end of the degenerated distal stump. However, the method cannot be recommended for adoption in surgical practice since other methods for bridging nerve defects offer greater assurance of success.

Series No. 21. Direct Suture of Nerves Under Tension.—Ulnar nerve of dogs, eleven experiments, respective animals under observation for periods varying from twenty-two to 324 days.

In this series use was made of the resected ulnar nerves of certain of the experiments in Series Nos. 16 to 19. A silk suture was passed through the central and distal stumps of the ulnar, resected to the extent of from 4 to 5 cm. and by applying tension and flexing the limb the resected nerve ends were brought to as close approximation as possible and sutured. In a number of these experiments the line of suture was wrapped with several layers of alcoholized Cargile membrane or a formalinized artery sheath was applied. In other experiments the wound was closed without sheathing the

suture line. Purposely, no endeavor was made to immobilize the limb. On opening the wounds in the several experiments at stated intervals, it was noted that in all but one experiment the suture had torn out either centrally or distally and that the nerve ends had separated for a distance about equal to that obtained before the tension sutures were applied. In the one experiment in which the suture did not appear to have been torn out, limited neurotization of the distal stump was obtained.

DISCUSSION

LIEUT.-COL. DEAN D. LEWIS: We are to be congratulated on having this paper presented at the present time when so many peripheral nerve injuries are being treated. There is one thing that I think has been definitely demonstrated; namely, that all regeneration takes place from the proximal stump. I also believe that it has been definitely proved that without protoplasmic bands no regeneration takes place. That is illustrated in section of the spinal cord or in section of the optic nerve.

I believe all peripheral nerve surgery should be taken care of in evacuation hospitals and that in all cases primary suture should be done. It is exceedingly interesting to study peripheral nerve injuries in the evacuation hospital, say fifteen hours after injury. In all the cases I have seen, either from high explosives or machine-gun bullets, the nerves immediately after section have been found contused. A machine-gun bullet may make a perfectly clean hole, but if one examines the peripheral nerves, one finds on each side of the defect for half an inch that all elements of the nerve are destroyed. So if an attempt is made to make suture, considerable approximation must be accomplished to get neurofibrilla in contact with neurofibrilla. In the musculospiral it is practically impossible to approximate these without flexion of the elbow, or in the sciatic without flexion of the knee to a right angle.

There has never been much opportunity to study these nerves that had primary suture. It is unfortunate that the primary sutures at the evacuation hospitals are so distributed in this country that it is impossible to make a study. At Fort Sheridan I have found only one case of extensive primary suture. Quite a number of the cases, in fact the majority of them, have had a separation of the nerve ends with a neuroma. They have had complete loss of function primarily, but they have gradually improved. Now, six or seven months after the injury, we find that this preliminary return of function has come to a stationary point. I operated on two cases this morning, which had improved rapidly for some time, but for the last three months had been stationary. In one of these cases, which was the sciatic, I found just a few adhesions. The only thing to do was to excise the neuroma and attempt a neurolysis and suture the healthy muscle above and below and wait for return of function. The second case I operated on this morning had what was theoretically a complete ulnar lesion and a partial median lesion. The ulnar had a very distinct lesion of the nerve with some of the funiculi destroyed and yet there were enough funiculi left to conduct the impulses through. The median was bound in scar tissue. It was merely an indication for neurolysis. There are very many cases with division of both nerves. The most serious are the lesions in the arm in which the median and ulnar are divided. It is surprising that an ulnar lesion alone is less frequent than an ulnar combined with a median. If you flex the forearm to get an end-to-end suture of the separated ends of the ulnar, it is difficult to handle the

median. It is much better to make an end-to-end suture of the median and to transplant in the ulnar than to sacrifice the ulnar by doing some other operation on the median.

There is no doubt that the ideal nerve repair is end-to-end suture and that it should be attempted in all cases. To resect the humerus in order to make an end-to-end suture of the median or the ulnar, in my opinion, should never be done.

In lesions of the sciatic of over 2½ inches' defect, one can flex the knee to a right angle and immobilize and close a defect of nearly 2½ inches. In the case of the ulnar just above the wrist-joint, it is practically impossible to close any defect by flexion of the wrist. In these cases an auto-transplant ought to be used. In most of these cases you can get an auto-transplant directly from the site of your operation. For instance, in the case of the median or ulnar, you can use the cutaneous branch. I think that is the operation of choice. In cases where you cannot well sacrifice the cutaneous nerve, I think a man is justified in using some form of tubulization, using either a formalinized artery or a fascial tube. A fascial tube has a distinct limitation in all these injury cases, because a fascial tube transplanted in the presence of scar tissue will become scar tissue. That is the fate of fascial tubes in all these wounds.

I think we have three things to take into consideration. First, primary end-to-end suture on those cases with small nodules in the nerve. Then linear section and auto-neurolysis with the idea of allowing the nerve to expand to allow the nerve axons to grow through. Second, combined with this, the operation in which one dissects off the scar tissue . Third, if one cannot bridge the defect, an auto-transplant should be used.

In all these nerve operations we must consider the after-treatment. There are some sad things happening in war surgery by over-emphasis of certain points. Thomas, years ago, said that all paralyzed muscles should be placed at rest. We heard for many years about the cocked-up splint for musculospiral paralysis. Now, some of these boys have worn the cocked-up splint for the cure of drop-wrist for so long that they have an ankylosis of the wrist. It is just as harmful to over-stretch healthy muscles as it is to maltreat paralyzed muscle. To make a primary suture is by no means to finish the case. The after-treatment is most important in the correction of the paralysis.

Another thing sometimes forgotten is that up to the present time we have not had the opportunity of studying the results of our operations on nerves. I do not believe we can say anything about the return of function in these cases, even in the musculospiral or popliteal, for at least seven months. It would be very unfortunate if any of these wounded men were discharged before the period has expired in which we can expect a regeneration, because if we are going to learn anything in the line of peripheral nerve surgery from this war, these men must be watched for at least two years before we can make definite statements in regard to operations on peripheral nerves.

Major Lewis J. Pollock said that statistics relative to the incidence of peripheral nerve lesions sustained in battle were not as yet available. Those obtained from reports of the American Expeditionary Forces were not reliable for the reason that many cases of peripheral nerve lesions were not referred to the neurologist. As a result a large number of patients suffering with severe wounds, or those requiring complicated dressings were not observed from the neurologic standpoint. As consultant to a number of base hospitals, Major Pollock had between thirty and fifty such cases referred to him during a

month from each of these hospitals. A survey made of the cases brought to his attention on Sept. 7, 1918, when the population of the hospital under investigation was 1,440, revealed forty cases, or a percentage of 2.77.

In the early part of November, 1918, the total figures submitted to the chief consultant in neuropsychiatry led him to believe that the percentage of peripheral nerve cases in the American army was 1.76. This did not approach the figures given by the French and British, which were nearly 6 per cent. At this time a bed to bed examination of all patients wounded in extremities was made and in four hospitals under Major Pollock's supervision it was found that of 2,130 cases examined, 332 had peripheral nerve lesions. The total population of these hospitals at the time was 7,050. The percentage of peripheral nerve lesions in the total population was 4.5. The percentage of peripheral nerve lesions in cases examined was 14.9.

Analyses of the types of lesions seen were inaccurate for similar reasons. The prominence of certain clinical symptoms in some injuries made it necessary to submit such a case to the neurologist, so that ulnar lesions were very frequently referred to the neurologist whereas median lesions were frequently overlooked. Internal popliteal lesions were rarely referred to the neurologic department.

The lack of standard nomenclature often contributed to the reports of internal popliteal lesions where a partial sciatic lesion was present.

The striking feature of the clinical picture of early nerve lesions was the large percentage of marked and rapid improvement. An analysis of the first 100 cases seen in Base Hospital No. 13 showed that after three months sixty-one cases had been discharged. Twenty of these cases had sufficiently recovered to be sent to convalescent and replacement camps. Thirty-nine cases remained in the hospital; twenty of these were manifestly partial lesions, and only five were so severe as definitely to indicate the necessity for surgical interference.

The actual percentage of recoverable cases of peripheral nerve lesions can only be ascertained when accurate statistics of the cases suffering with disability as the result of a peripheral nerve lesion may be compared to statistics of the occurrence of peripheral nerve lesions in battle. It might be mentioned that probably 10,000 peripheral nerve lesions were sustained in battle. Not very many more than 3,000 cases had been classified as peripheral nerve cases in the hospitals in the United States. Only one third of the cases observed in United States General Hospital No. 28, Fort Sheridan, Ill., would require operative interference and of these cases but the smaller proportion would require nerve suture.

Dr. W. R. Cubbins: I would like to ask the essayist the age of the animals that were used and if the transplants were put into nerves that were freshly sectioned or into nerves that had been traumatized.

Dr. A. B. Kanavel: I would like to ask one question: In the transplantation of tissue from one person to another is it not a good plan to test the cytolytic action of the serum of the donor on the serum of the recipient of the transplanted tissue? In man it may differ from that of the lower animals. In man we more often have a cytolysis that affects the cells of the transplant. Before I went to war I was engaged in the experimental investigation of transplantation and we had very great difficulty to obtain dogs in which we could show hemolysis.

As to the combined injury of the ulnar and median: When there was a defect in the ulnar that was difficult to bridge, I transplanted the ulnar to the

anterior surface of the joint thus, placing the nerve on the flexor instead of on the extensor surface. In that way I have been able to treat both lesions.

PROFESSOR HUBER (closing): In all these experiments except the first few in the treatment of neuroma, practically all the dogs that were used were 2 or 3 years old. I have only two experiments of secondary transplantation in which the neuroma was cut out and transplant put in. One of these happened to be a homo-degenerated nerve and the other was a homo-transplant. Personally, I feel that it makes no difference whether we are operating on fresh animals or not. I think in all this work we are simply gaining practice that can be applied to surgical technic. I think one could remove a neuroma not only once but several times, and the neuroma will reform and reform. I think the surgeons have had that experience with their methods in the past, and have found that neuromas reform after they have been removed. That means, of course, a new outgrowth from the stump. I cannot say how many times that will take place, but I know it will take place a number of times. I think as far as the neuromas are concerned that they will grow down from the stump after the primary injury. There is a little doubt as to how long after degeneration the nerve fibers will go down into the peripheral stump. I think Colonel Lewis collected statistics for a time, and I think he found that after the ninth month this occurred, but up to the ninth month it made very little difference as to the time that elapsed between the operation and the suture. After the ninth month there was a difference in the result, although, as I recall, there were successful cases in which the suture was done years later.

I feel that the transplant may be either an auto, hetero, or one of the homo sort in case of secondary suture if enough of the stump is removed to get above the neuroma into the healthy tissue. The neurons will grow just as they did primarily. If there is no transplant, there will be formed a new neuroma.

I am aware of the situation as far as human surgery is concerned with reference to hemolysis and the other condition that Dr. Kanavel speaks of. I do not think it is necessary to have a living transplant. I think stored transplants show that qualification. I was myself surprised to see neuraxes growing down in the transplant after it had been soaked in 50 per cent. alcohol, and still they grow down in a nerve that has been injected with absolute alcohol, as is done in cases of neuralgia. I suppose even Dr. Patrick has had cases of recurrence of the neuralgia after injections of alcohol.

DR. PATRICK: It *always* returns.

DR. HUBER: There is very good experimental evidence. I believe that the neuron sends out neuraxes which make use of the neurolemma sheaths as paths of least resistance and reach the peripheral stump in that way. I want to take this question with methods other than the silver staining. I think some time, if time permits, I shall study again nerve regeneration in the central nervous system and optic nerve. I am not quite certain whether the opinion of surgeons and experimenters in regard to regeneration in the central nervous system and in the optic nerve is correct, and whether after all there is not an attempt at regeneration. We have in the central nervous system and in the optic nerve no neurilemma sheaths. We have no paths of least resistance, no little tubes through which the axons can pass. We have neuroglia which is very quickly replaced by connective tissue. I believe one will be able to show that if the central root is cut and sutured, the neuraxes will pass up

into the cord so far as there are neurolemma sheaths, and then form a neuroma inside as soon as you get into the tissues of the central nervous system. I do not recall any very recent work. I do not recall any careful experimental work more recent than that of Ströbe, with the technic of whose work I am familiar. I used it in 1895, and since that time I think we have learned to stain neurons better than Ströbe stained them.

Surgeons who are familiar with the work of Foramitti in using formalinized artery tubes may know that these artery tubes, calves' arteries, were used by Hashimoto in the Russo-Japanese War, and used in the Balkan War extensively. We have used this method in perhaps six or eight cases, but we used with them an auto-transplant. These I have not reported on tonight. In a number of cases we bridged the gap in the ulna of 4, 4½ or 5 cm., by inserting the ends of the resected nerve into the lumen of the formalinized artery. In two of these cases the neuraxes reached the peripheral stump and there was observed regeneration of the peripheral stump, but not so good as when a transplant was used. It is a method that could be used. I feel I cannot state from personal experience that there is not the same amount of connective tissue formation following the use of a formalinized artery as with a fascial tube. The formalinized artery will remain in place and is not absorbed, at least for six months after implantation. The neurons pass down through the lumen of the tube and reach the peripheral nerve stump.

PHILADELPHIA PSYCHIATRIC SOCIETY

Regular Meeting, May 9, 1919

CHARLES S. POTTS, M.D., *President*

DRUG TOXEMIAS, THEIR NATURE, ETIOLOGY AND SYMPTOMATOLOGY. Presented by DR. JOSEPH C. DOANE.

Dr. Doane said that since March 1, 1915, when the Harrison law became effective, much misplaced sympathy had been lavished on the drug taker. Cheap sensationalists had seized on the subject of drug diseases to add to their own incomes, without any knowledge of the subject, or any desire to do good. The stage had also aided to disseminate misconceptions as to the nature of the disease, and such publicity had only added to the number of persons who needed only to know of a vice to become vicious.

The term "drug habit" was not descriptive, for the continuance of the use of a drug was not truly a habit. The physiologic action of the drug did not explain the etiology of drug disease. Symptoms of withdrawal yielded to the drug which brought about withdrawal pain and might partially explain drug abuse. Rather did it seem that drug addiction was but a symptom of some physical, moral or mental abnormality, and that moral and mental degeneracy were but the parents that begot the litter in which drug inebriety, sexual perversion and other social monstrosities were numbered.

Out of a series of 393 cases of drug disease studied at the Philadelphia General Hospital, 267 began the use of drugs on the advice or example of others so afflicted. It appeared, then, that drug disease was but an inevitable expression of some abnormal moral or mental trend, and that this particular form of expression was more or less accidental. Relief of pain, physicians'

prescriptions, ignorance of content of long-continued medication were but predisposing factors that increased the receptivity of an already more or less fertile soil.

Crime and drug addiction were closely linked, for with an increasing need for drug went a decreasing earning power.

Cures were few, temporary relief more frequent, and relapses the rule; but nature frequently cleared the stage of these handicapped persons with her keen weapons—tuberculosis, pneumonia and syphilis.

THE TREATMENT OF NARCOTIC DRUG ADDICTION. Presented by DR. JOSEPH MCIVER.

The purpose of Dr. McIver's paper was to relate in a general way the principal factors concerned in the treatment of narcotic drug addiction. His ideas in the treatment of these cases were drawn from observations made on a large number of drug users coming to the Philadelphia General Hospital while he was a resident there.

There were many of the so-called specific methods of treating the drug habitué, but as to the advisability of their use and the permanency of results claimed by some of their promoters, he was somewhat skeptical. With these patients a considerable allowance had to be made for individual differences, and to try to blend them to a machine form of treatment was a very unwise procedure. In the beginning he wished to say that all these cases could best be treated in a hospital or sanatorium. Before any form of treatment was begun, he could not emphasize too strongly the necessity of a complete history and thorough physical examination. A special effort should be made in every case to establish, if possible, the factor that caused him to begin the use of drugs. The treatment of any drug addict was based essentially on the gradual withdrawal of the drug, free purgation and sedatives or stimulants, as might be required in the individual case. For the first twenty-four hours, the patient should be given enough drug to keep him comfortable; by this method, one acquaints himself with just how much of a drug the patient really needs. Patients should be given the same drug they have been accustomed to and by their usual methods. The drug should be withdrawn gradually, and especially is this true with the aged and debilitated. As the drug was being withdrawn, the patients often suffered from nervousness and insomnia; the symptoms could be alleviated to a large degree with very hot baths. The bromids, trional and scopolamin in ordinary dosage were also of great value here. For the nausea and vomiting which were often so persistent, gastric lavage and restriction of diet were perhaps the best remedies. For the pains in the limbs, the so-called withdrawal pains, which were usually very annoying, electric massage proved beneficial. Some of the coal tar derivatives, as aspirin and the salicylates, might be used to advantage. The diet during this course of treatment should be simple and nutritious, consisting principally of milk and eggs.

The one essential factor on which the treatment of the drug addict was based was the presence in the blood of an antidotal toxic substance. That such substances did exist in the blood was proved by Adriano Valenti at the University of Pavia in his experiments on dogs. Taking this as an axiom, the conclusion was easily drawn that elimination was of utmost importance. After the drug had been withdrawn, the patient was usually in a weakened condition

He should remain in bed on tonics, an especially liberal diet, until he had gained sufficient strength to begin moderate and graduated exercises.

The most difficult stage of the treatment was to give the patient sufficient moral, mental and physical strength to keep him from returning to the use of drugs. His physical strength could be regained by the usual methods employed in physical upbuilding, and of course with this would return a certain amount of nervous and mental energy. After all this was done, however, many of them would still lack the fundamentals of good manhood. A change of environment and good physical condition were necessary for his future welfare.

Conclusion.—1. A careful study of the case before treatment was begun.

2. Free purgation, gradual withdrawal of the drug with stimulants or sedatives, as might be required in the individual case, were the essential features.

3. Any form of treatment that did not consider the presence of an antitoxic substance in the body long after the drug had been withdrawn and provided for the care of the patient during that time was almost sure to be void of permanent results.

FEDERAL AND STATE LAWS IN RELATION TO THE DRUG HABIT. Presented by Dr. John H. W. Rhein.

The first effort to control the use of opium as a habit by law was in 1729, when Yung Cheng issued an edict against the smoking of opium in China, the penalty being transportation and death. In 1906 again an edict was issued prohibiting the consumption of opium and the cultivation of the poppy. This was the result of the widespread use of opium as a habit in China where 27 per cent. of the males of that country were said to smoke opium. The Chinese nation looked on the habit as a great national, moral and economic menace. In 1909 there was an international conference in Shanghai representing Germany, United States, Japan, China, France, Great Britain, Italy, the Netherlands, Persia, Portugal, Russia and Siam. The object was to regulate the importation and exportation of habit-forming drugs, and to provide for their use medicinally only.

The Harrison act in 1914 was the first law in the United States to be passed for the purpose of regulating the illegal use of narcotic drugs, and the Pennsylvania law passed in 1917 was intended to supplement the federal law, and to strengthen it so as to cover certain features which the federal law, an internal revenue law, did not cover. The recent amendment to the federal law increased the tax and made it unlawful to purchase, sell, dispense, or distribute drugs except in original packages. The primary object of the federal law was to regulate and control the sale of narcotic drugs to the end that they could only get into the hands of ethical doctors and pharmacists.

The effect of the federal law at the present time is to make it extremely dangerous to sell the drug illegally, and the drug vender stands a good chance of going to prison. The federal act had not hitherto been effective so far as the venders were concerned, against whom the accusation was merely possession, unless it was shown that they were vending at the same time. It had not been easy to convict owing to the difficulty in obtaining evidence acceptable to the courts, as the kind of evidence which could convict; recently, however, venders have been brought to time in considerable numbers, and convictions have been accomplished more readily than formerly.

One of the important decisions of the United States Supreme Court was that the law was constitutional which provided that drugs could be disposed

of only on an order written on a form furnished by the commissioner of internal revenue, or on a physician's prescription, and forbidding a physician to prescribe for an addict except in a curative treatment.

The venders apparently have had no difficulty in obtaining the drug. It has often been stolen from wholesale houses. It was believed that there were some of the big dealers in town who were breaking the law, and two or three had already been accused. It has been common to find a prescription for an ounce of morphin at a time and there have been thousands of prescriptions issued for a dram at a time. The state forces have found that the amount of drugs sold by venders is small in comparison with the amount supplied to drug users by physicians. Many physicians who have broken the law technically are inclined to obey the law when their attention is called to their errors in reading or interpreting the law, which was rarely read carefully, if at all.

The drug habit is really a social evil. It flourished mainly with the delinquent; it is as incurable as crime. Removal of the drug from one addicted to the use is a simple matter, but to prevent his returning to it is a social problem, which means the reform of the character of the individual.

The Pennsylvania law is a good one and, if its provisions were strictly enforced, it would practically eliminate the use of narcotic drugs as a habit. But it is one thing to make a law and another to carry it into effect, and to do this would require a personnel many times greater than was provided for and perhaps ever would be. The result is that the drug habit continues to exist and will continue to exist as long as does the criminal class. The drug habit will continue to exist, too, as long as the supply from manufacturers is not restricted. If it were possible to place the distribution of the drugs in the hands of one state official whose business it would be to supply the drugs for legitimate purposes only, the quantity in circulation could be regulated to meet only the need for medical purposes.

DISCUSSION ON DRUG HABIT

Dr. F. H. Baldi said that he had had the good fortune of spending six months in France as medical officer with the U. S. Marine Aviation Force, and while there had opportunity to learn of the drug evil in London and Paris. We knew to what extent our own city was infested with the drug evil. It might be consoling, if that were possible, to know that conditions over there were so frightful that they were beyond conception as compared with conditions here.

If the production of narcotic drugs could not be controlled, we would be in a very unfortunate position. All the legislation in the world would not cure the evil. A good plan would be to educate the people as to just what the addiction is, what it means to humanity, and to what it will lead criminally.

Dr. Baldi believed thoroughly in the quick and absolute withdrawal of the drug, and had never seen any deaths caused by it. It was a method which was rather difficult to practice at home, but had worked charms in the Philadelphia County Prison where he had practiced it with most excellent results for over five years.

The cardinal factors in the treatment were: 1. Isolation; 2. absolute control of the patient; 3. deprivation of the drugs; 4. no substitute of any narcotics; 5. elimination by bowels, kidneys and skin; 6. rest, nourishment and work.

CHICAGO NEUROLOGICAL SOCIETY

Annual Meeting, May 15, 1919

HUGH T. PATRICK, M.D., *President*

SWIFT-ELLIS INTRASPINOUS INJECTIONS FOR GENERAL PARESIS. Presented by DR. PETER BASSOE.

Dr. Bassoe reported Swift-Ellis treatment in general paresis, in twenty-six cases in which the treatment was commenced and in most instances completed during the years 1914, 1915 and 1916.

Of these patients eight are known to be alive; three of them mentally and physically well, three mentally well but physically crippled, one mentally improved, one temporarily improved and now relapsed. Charts were presented showing the laboratory tests and the form of treatment. The largest number of intraspinal injections in any one case was thirty-three. In this patient the first symptoms occurred in 1912, in the form of apoplectiform attacks with transient aphasia. When first seen, in 1914, the patient presented the usual mental and physical signs of early paresis. The treatment has been continued intermittently up to the present time and the patient has been able to be at work almost continuously.[1]

Following an intraspinal injection of 32 c.c. of salvarsanized serum in September, 1916, this patient developed a typical picture of "aseptic meningitis," with stiffness of the neck and legs, loss of sphincter control and a cloudy spinal fluid with a cell count of 1,992, mostly polymorphonuclear cells. He recovered from this in a few weeks. The most severe reaction observed was in a man (Case 26) in whom the onset was very sudden in December, 1916, and the laboratory tests were strongly positive. In the course of a week following an intraspinal injection in February, 1917, he developed a spastic paraplegia which has persisted. After six months he was able to walk about the house with the aid of strong mechanical support, and is now slowly improving. Mentally, however, he has been perfectly well since the spring of 1917, and the laboratory tests became negative.[2]

A man, aged 50, with tabes of long standing, developed mental symptoms so that his case became one of taboparesis. After a prolonged course of treatment his mental symptoms disappeared but he, too, developed a paraplegia of more gradual onset than in the case just referred to. In another case of taboparesis the mental symptoms also cleared up completely and the laboratory tests became negative, but the patient has to walk with crutches on account of a fracture of the neck of the femur which failed to unite. Following the fracture, which was a painless one, there was a brief recurrence of mental disturbance, but during the past two years the patient has been perfectly well mentally and has worked steadily as a clerk in an insurance office.

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1. A few weeks after the reading of this paper the patient developed delusions of grandeur and persecution and was committed to the Chicago State Hospital.

2. Detailed histories and charts of this and several of the other cases related will be found in the Chicago number of the Medical Clinics of North America, 1919.

In the three cases with apparent complete arrest of symptoms comparatively little treatment had been given, but in view of the characteristic symptoms and positive laboratory findings, there is some reason to believe that the treatment which was given at an early stage may have been a factor in producing the subsidence of the morbid process.

Dr. Bassoe merely wished to place these case records before the members without making any claims for this mode of treatment. Some of the facts here presented, in his opinion, tended to show that salvarsanized serum is not as inert as is claimed in some quarters, but that at least at times it may produce rather striking changes in the condition of the patient either for better or for worse.

DISCUSSION

Dr. Ralph C. Hamill called attention to the use of mercuric chlorid injections, and stated that for some years he had used $\frac{1}{150}$ to $\frac{1}{100}$ grain of mercuric chlorid dissolved in spinal fluid. The mercuric chlorid was placed in the syringe and then from 15 to 25 c.c. of spinal fluid were drawn into the syringe, allowing the mixture to take place there, and the solution reinjected. There is enough albumin in the spinal fluid to cause a resolution of the albuminate of mercury which is formed by the mercuric chlorid and spinal fluid acting on each other in the syringe. He had succeeded in getting a negative Wassermann by this method when other methods had failed.

As to the meningeal reaction which Dr. Bassoe referred to, in repeated spinal punctures after injections into the spinal canal he had found a very pronounced pleocytosis. He wondered if anything had been discovered as to the curative value of the pleocytes in the sense that they were phagocytic cells and reached the syphilitic foci not reached by the chemical reaction of the medication.

Dr. George W. Hall had been interested in intraspinal work for some time and in the diagnosis of general paresis. He thought Dr. Bassoe would agree that some of us would have to change our criteria of a positive diagnosis if we are to agree with all his diagnoses. In Case 26, in which he obtained such splendid results, he thought it was a rather atypical case of general paresis. In the first place, the patient did not have a positive Lange reaction, and in his opinion, if this reaction is of importance in anything, it is certainly of importance in the diagnosis of general paresis. In his own work, if there was a negative Lange reaction he withheld his diagnosis and allowed the therapeutic tests to aid in the diagnosis. He believed that cases which might clinically be regarded as general paresis, but did not show a positive Lange curve, must be put into the questionable class. He thought a good many of the cases were diffuse syphilitic endarteritis rather than general paresis.

As to the intraspinal medication, he had done a good deal of work in that line at the County Hospital, using the mercuric chlorid and succinimid of mercury, also using it dissolved in the spinal fluid. They were now using serum of the patient's blood, injecting it into the spinal canal and after the injections of the serum administering intravenous medication to see if any results could be obtained in that way. He thought this much less dangerous if results could be obtained. The cell count after injection of the plain serum showed marked increase in the cells, from 2,000 to 3,000 in some cases, and

in others it was not so large. He hoped to be able to report results in the near future. The dose of the mercuric chlorid he thought should not exceed 1/50 grain but up to that it was perfectly safe. On going higher than 1/50 grain he had not infrequently had retention of urine and once or twice had to catheterize the patient. If he stuck to 1/100 or 1/50 grain, he got no serious results. Caution should also be used when alcoholism complicated the case. He believed spinal medication of any kind was very dangerous in an alcoholic.

Major Lewis J. Pollock said that the futility of ordinary methods of treatment was usually referred to the fact that the choroid plexus was impermeable to drugs. This belief has been based on the work of Goldmann, which has not withstood the test of time. McIntosh and Fildes at first stated that arsphenamin was not neurotropic and in this opinion Ehrlich concurred. Later, when they found that they were unable to obtain from the washings the amount of arsphenamin which had been mixed with a macerated brain, they concluded that the brain tissue did take up some of the arsphenamin and stated that the meninges were impermeable to the drug.

This conclusion was based on an experiment which did not comply with the conditions found in life.

The permeating power of drugs depends on several factors; their passage through the blood vessel, through the cell membrane and the ability of the cell substance to take up the drug. Overton stated that only fat soluble substances would penetrate the brain by an intravitam injection. This had not proved to be the case. The permeability of the meninges and vessel walls is responsible for but one part of the success or failure for intravitam stains to reach the brain. The permeability of the meninges may be increased by the intraspinal administration of any foreign substance, as was shown by Flexner's work on experimental anterior poliomyelitis. The most important factor is the refusal of the cell contents to take up the drug. This has been proved by the work of Overton, who showed that if the cell membrane be nicked and a gradient formed the substances which would not stain the cell with an intact membrane would not stain it with the membrane punctured. That permeability of vessel walls or meninges is not the important factor was shown by the facts that some crystalloids fail to act as vital stains, whereas colloids do act as vital stains in many instances.

The choroid plexus alone cannot be held responsible for the failure of certain drugs to reach the brain.

Dr. William Allen Pusey had been much interested in the discussion. He had not treated central nervous system syphilis but some dermatologists had treated a good deal of it and had messed it up, which did not surprise him when experts such as these differed so widely in saying when the disorder was paresis and when meningovascular syphilis. He was much interested in the treatment of late syphilis, and had become rather prejudiced against the treatment of paresis and tabes at present in vogue. The careful reports he had just listened to had not changed his views. He had not been impressed with the conclusiveness of the findings. It reminded him a good deal of the findings in a series of carcinomas in the abdomen and chest treated with roentgen rays, the treatment extending over a few years. Some cases seemed to clear up, but as time went on the hopes diminished.

In Dr. Bassoe's cases the results did not seem conclusive. One patient who received seven or eight intravenous injections and only one intraspinous

injection showed great improvement. Another patient, a physician, received thirty intraspinous injections and a greater number of intravenous injections, and while he seemed better, the intraspinal picture did not improve. In another patient who received forty-two injections, the serologic picture remained unchanged. For a good while he had been seeing some of the untoward results of intraspinous medication and he felt gratified to find that they were not due to poor technic when the same results were reported by experts who were doing the same work.

To sum up, if he had paresis or tabes he would not take intraspinous medication with the hope of getting well, but would let the thing pursue its course as rapidly as it might. To his mind these things were quite analogous to what was being done in syphilis in general and he had given a good deal of thought to what was being done at present. He was by no means sure that the syphilitic was better off today than he was ten years ago. Undoubtedly there were more neuroresidue and renal complications than before. In late syphilis some physicians were trying to make the patients negative in spite of everything, and his notion was that in trying to use the man as a retort they were not helping him. It might help to make him negative, but if he became negative, he came back after a while and in repeating the treatment very often they did considerable damage to the man. He had seen a good many cases of this kind and going back to himself as a criterion, if he had old syphilis he would try to get in good shape clinically and treat his syphilis as well as he could on the clinical data, but he would not undertake to let anyone make him negative by way of the spinal fluid. He thought nothing conclusive had been arrived at.

Dr. Sigmund Krumholz felt that the cases of syphilis should not be treated intraspinously. In the advanced cases of general paresis with distinct mental changes, if there were any prospects at all of being cured by the way of intraspinous injections, he thought they should be used. From the reports of Dr. Bassoe, in about one third of the cases he had observed there was improvement. Two or three of the cases went bad in three years, but if they had been ameliorated or almost cured for that length of time it was a great accomplishment, and he thought the treatment should be encouraged. He failed to see why any paretic should be left alone when there was any hope at all from intraspinous treatment. In syphilis of the central nervous system he never used the intraspinous injections, and thought this should not be done because the intravenous injections produced the same results.

Dr. Sydney Kuh said that most of those present knew that before they could make a positive diagnosis of tabes there was a very marked degeneration of nerve fibers in the spinal cord. He thought they all knew that as soon as they could make the diagnosis of paresis there was a degeneration of nerve cells and of nerve fibers in the cortex of the brain. He could see that before there was the least suspicion of any mental change a great deal of nerve tissue was gone. He asked if the gentlemen who reported apparently cured cases after intraspinous treatment believed that the nerves regenerated after this treatment, or any other form of medication, was used.

Dr. G. B. Hassin said that while it was true that in general paresis a large number of cortical ganglion cells are always more or less damaged, many of them may remain intact. In addition, interstitial changes may pre-

vail in the form of miliary gummata, as shown by Sträussler. The miliary gummata, of course, may be responsible for some of the symptoms of general paralysis. Finally, there occur the aberrant types of this disease described by Lissauer and Alzheimer which usually run a more favorable course and give a better prognosis. Probably some of the cases reported here by Neyman and Bassoe as improved belong to this class, especially Bassoe's patient with attacks of aphasia. Such cases usually improve from any method of antisyphilitic treatment, including the intraspinal one.

Dr. Clarence A. Neymann, referring to the effect of the pleocytosis, said that a few years ago Dr. Sidney Miller had injected a few patients with a very weak solution of sodium nucleinate, and this put the cell count up to 2,000 or 3,000 and caused a true meningitis. In the few cases that were treated in this way good results were not observed, and the treatment was discontinued because of very bad bladder effects. If general paresis were a disease that might otherwise end favorably, he would not advise intraspinous treatment. In a large series of cases without treatment, Cotton had had only 4 per cent. remissions, but in a series with intraspinous treatment there was 25 per cent. of improvement and he therefore thought such cases should be treated. As regarded the intravenous as opposed to the intraspinous treatment, in his worst cases the only death he had had followed prolonged intravenous treatment. This might have been due to the diarsenol brand of arsphenamin; if arsphenamin was pushed beyond a certain point, they were bound to get a bad result and often this trouble was a good deal more serious than the other trouble combined with paraplegia.

Of course nerve tissue once degenerated cannot be replaced, but the nerve tissue that was left could take over the function, to some extent, of that which was lost. He thought it made no difference whether the mercury was introduced into the serum as a solvent or into the cerebrospinal fluid as a solvent.

Dr. Peter Bassoe thought the problem of the treatment of general paresis was very much like that of brain tumor. If the brain tumor were allowed to take its course in a series of twenty-six the patients would get worse and worse, go blind and die. If operated on, some would live and some might get well and he felt that in view of the unfavorable prognosis it was justifiable to give treatment that might cause damage in general paresis, just as an operation on the head for brain tumor might cause damage.

In regard to the diagnosis, if the patient in Case 26 did not have general paresis, what did he have? He did not have tabes; he had increased reflexes, unequal pupils and distinct mental confusion and acted like the ordinary case of general paresis. Dr. Hassin brought out a different kind of case which clinically might be called paresis. Some patients had interstitial changes and some parenchymatous changes; the interstitial changes were influenced by treatment. Those cases that came on suddenly had the best chance for improvement, notwithstanding that they had a lot of plasma cells and infiltrations. He did not think it possible to tell beforehand what kind of a case one was dealing with, so it remained a very obscure thing. Many of his patients had very extensive intravenous treatment without improvement, but they showed at least temporary improvement after intraspinous treatment.

Major Pollock asked if the patients would have shown the same degree of improvement if the treatment had not been accompanied by the introduction of arsphenamin into the vein to produce the arsphenaminized serum.

Dr. Bassoe thought the arsphenaminized serum possibly acted mainly as an irritant.

Dr. L. Harrison Mettler asked if any large number of cases were reported in which intraspinous treatment was used and a record kept in comparison as a control with other cases.

Dr. Kuh said he had seen institution statistics showing that cases which were injected lived a shorter time than those not injected.

Dr. Bassoe said that Cotton had reported a large number of cases treated and untreated; in the treated cases there was 25 per cent. of remissions and in the untreated only 4 per cent. On the whole, institutional statistics were unfavorable. His cases were not of a severe type and would not ordinarily be in institutions.

Book Review

VEGETATIVE NEUROLOGY. By HEINRICH HIGIER, M.D., Warsaw. Authorized translation by WALTER MAX KRAUS, A.M., M.D., New York. Published by the Nervous and Mental Disease Publishing Co., New York and Washington.

A valuable addition to the Monographs on Nervous and Mental Disease is the recent contribution by Dr. Higier. As Dr. Higier observes in his introduction, the vegetative nervous system has received but scant attention from physicians. The translation of "Vegetative Neurology" by Dr. Walter Max Kraus of New York fills a gap left by the textbooks on clinical medicine. Although it is obviously out of the question for the clinician to devote much time to the comparative anatomy and embryology either of the vegetative or the cerebrospinal nervous system, the anatomy and physiology, as well as the pathology and pharmacology of the vegetative nervous system should have fully as much attention given to them as is directed to the anatomy, physiology, etc., of the central nervous system. Dr. Higier's summary of the latest researches in vegetative anatomy, physiology, and pathology demonstrates the importance of involuntary mechanisms of the lower neurons for the maintenance of normal physiologic equilibrium. In the light of vegetative neurology, abnormal function may often be traced to derangement of the sympathetic or of the autonomic systems, or of ductless glands, the secretions of which influence these systems. How much influence such derangements may exert on the development of mental disorders is as yet uncertain, since in the psychoses and psychoneuroses there is set going a vicious cycle involving the cerebral cortex and the spinal and vegetative neurons, the initiation of which is difficult to ascertain. In any event, vegetative pathology appears to be of no little importance to the neurologist and the psychiatrist, as well as to the internist.

After a brief summary of the gross and microscopic anatomy, of the histology and embryology of the vegetative nervous system, there follows a chapter of twenty-eight pages on the physiology of the vegetative system that gives the reader access to the most recent conclusions and opinions on autonomic and sympathetic innervation. Under pharmacology and pharmacodynamics of the vegetative nervous system, the action of drugs (muscarin, pilocarpin, physostigmin, picrotoxin, atropin) and of internal secretions (epinephrin, iodothyrin, hypophysin) is discussed in relation to the sympathetic and autonomic systems. The physiologic action of atropin, epinephrin, pilocarpin, and ergotoxin on smooth muscle is summarized by Meyer and Gottlieb's chart, which, however, is not very recent (1911).

The pathology of the vegetative system and the clinical signs and symptoms of vegetative disturbances are discussed in comprehensive fashion. The author supports the theory of the Vienna school that hypertonus of the sympathetic (sympatheticotonia) and of the autonomic (vagetonia) produces distinct types of neuroses capable of clinical differentiation. Loss of that physiologic which results from the reciprocal innervation of smooth muscle is the outcome of overstimulation of the autonomics or of the sympathetics as the case may be. The rôle of the ductless glands in overstimulation of either

the sympathetics or of the autonomics is pointed out; likewise the influence of the vegetative nervous system on metabolism is not overlooked.

The subject of special vegetative pathology is discussed under anatomic headings thus rendering clinical observations on any part of the vegetative system speedily accessible. The entity of the disease vagotonia, a result of the overstimulation of the vagus and pelvic nerves, or perhaps the consequence of a loss of tonus in the sympathetic, appears to be established on a physiologic, as well as on a pharmacodynamic basis. The most satisfactory method of investigating systematically the functions of the vegetative system from the standpoint of pharmacodynamics is presented, together with the most important clinical signs.

Psychologists will find the monograph of interest in relation to the subject of psycho-physical parallelism. The physiologic evidence of viscera-cortical coordination as presented appears to be just as applicable, however, to the monistic theory of psycho-physical unity. James' organic theory of the emotions seems to be supported by the most recent investigations on the vegetative nervous system: in brief, we feel sad because we cry, are afraid because of tachycardia, increased peristalsis, and goose-flesh, etc. Whether this conception of the emotions be accepted or not, the influence of the visceral state, as affected through the agency of the vegetative system, the cerebrum and the mind is well brought out by Dr. Higier. The clinical psychologist, as well as the purely scientific investigator, will find his discussion of Veraguth's psychogalvanic reflex of value, showing as it does the extremely delicate reaction of the sweat-apparatus to psychic stimuli, a reaction much more sensitive than the pupillary reflex.

Under the heading "Endocrinous or Interrenal Secretory Glands" a brief summary of the physiologic and pathologic functions of the internal secretions is presented, a summary of eight pages giving the results of the latest investigations on this subject—one that is of so much theoretic and practical importance at the present time.

The contribution is unfortunately lacking in adequate diagrams. The inclusion of a diagram of the vegetative system, such as that of Gottlieb and Meyer, would have served as an excellent visual summary of the facts presented in the chapters on physiology, pathology and pharmacology. The three diagrams appearing in the work are instructive, if limited in scope. One portrays the course of the autonomic and sympathetic fibers in the cranial nerves; one, the innervation of the pelvic viscera; and one, the innervation of the male genito-urinary apparatus. These are illuminatiing, but do not present a unified picture of the whole vegetative complex, a desirable feature of so intricate a subject.

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